...DEPARTMENT

The RUBBER AGE

August, 1947

AUG 26 1947
...TROIT

For the compounding of natural rubber stocks refer to the 1942 Vanderbilt Rubber Handbook.

For the compounding of stocks using blends of natural and synthetics refer to the March-April, 1947, Vanderbilt News.

R. T. VANDERBILT CO., Inc.

230 Park Avenue, New York 17, N. Y.

DU PONT THIONEX

TEST DATA ON NATURAL RUBBER STOCK ACCELERATED WITH THIONEX

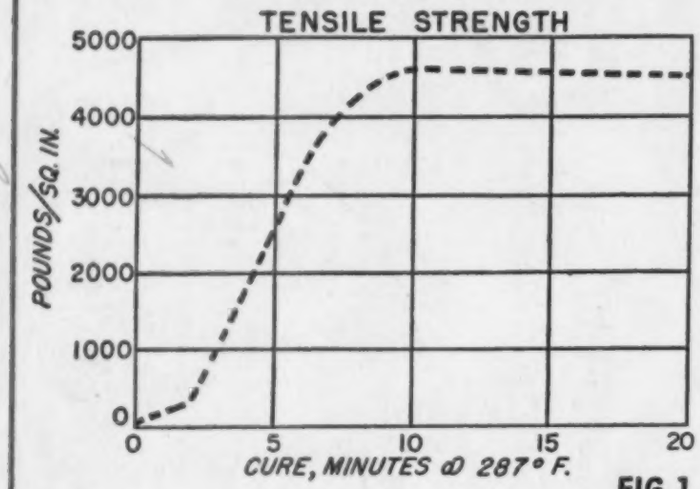

FIG. 1

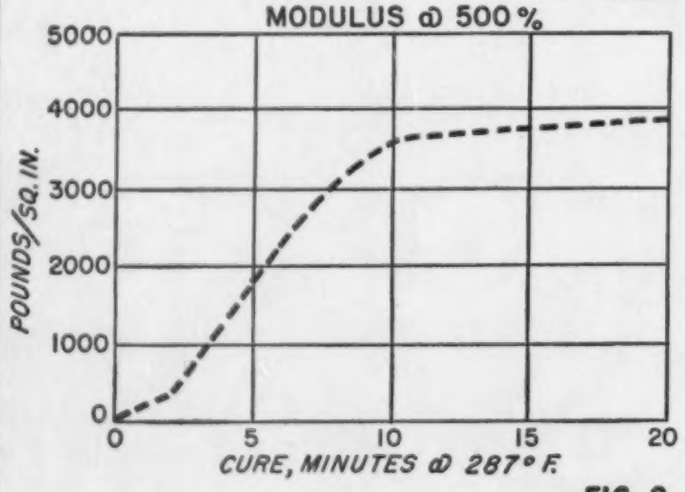

FIG. 2

THE HIGH-SPEED, SAFE ACCELERATOR *for natural rubber stocks*

With Thionex, it is possible to compound fast curing natural rubber stocks that can be processed without scorching. For, unlike other ultra accelerators, Thionex has a delayed action . . . a timed action that starts only after the temperature of the stock reaches curing range. But, at curing temperatures, the rate of cure of stocks containing Thionex is rapidly accelerated. This curing lag makes it possible to process stocks containing Thionex at temperatures close to the temperature of vulcanization, without danger of setting up. In the production of molded goods, Thionex accelerated stocks flow evenly . . . completely fill all sections of mold before vulcanization begins.

Delayed action and the fast curing rate of Thionex in a natural rubber stock are graphically shown by the tensile strength and modulus curves in Figures 1 and 2. The composition of the compound tested is shown in Table 1.

Along with delayed action and fast curing rate, Thionex has other advantages adding to its usefulness in natural rubber compounds.

1. **Compounds accelerated with Thionex have exceptionally good aging characteristics.**
2. **Thionex does not discolor white stocks or affect the shade of compounds containing organic colors; nor does it cause cloudiness in transparent stocks.**
3. **Master batches containing Thionex may be stored indefinitely without deterioration.**
4. **Thionex does not bloom to the surface of stocks that contain it, either before or after vulcanization.**
5. **Thionex is practically insoluble in water and does not affect the insulation resistance of compounds that contain it. This makes it especially valuable for insulated wire stocks.**

These advantages account for the widespread use of Thionex in the production of molded goods, drug sundries, hose, wire insulation, heels and soles, tires and many other rubber products. Write us for detailed information on the use of Thionex in your products.

TABLE 1

Composition of stock used in preparing test data

Smoked Sheets	100.0
Zinc Oxide	5.0
Stearic Acid	1.0
Sulfur	2.0
EPC Carbon Black	50.0
THIONEX	0.3

DU PONT RUBBER CHEMICALS

E. I. du Pont de Nemours & Co., (Inc.), Wilmington 98, Del.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

DU PONT

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TECHNOLOGY DEPARTMENT

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26
ETRO

PERMANENT RESILIENCE

Resilient parts made from HYCAR synthetic rubber *stay* resilient. That's partly because of HYCAR's unusual chemical stability—its resistance to oil and gas, acids and most other chemicals. And parts made from HYCAR are extremely resistant to the effects of oxidation, sunlight, and normal aging. A HYCAR sealing ring, for example, will maintain a positive seal through years of service even when constantly exposed to oils and acids inside the pipe, and sunlight and salt air outside.

Other unusual and valuable properties are listed in the box at the right. But most important, these properties may be had in an almost limitless number of combinations, each designed to meet the specific service conditions of the finished part. Parts made from HYCAR have seen service in *every* industry, giving long life, dependability, and economical operation.

That's why we say ask your supplier for parts made from HYCAR. Test them in your own applications, difficult or routine. You'll learn for yourself that it's wise to use HYCAR for long-time, dependable performance. For more information, please write Dept. HB-8 B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

CHECK THESE SUPERIOR FEATURES OF HYCAR

1. **EXTREME OIL RESISTANCE** — *insuring dimensional stability of parts.*
2. **HIGH TEMPERATURE RESISTANCE**—*up to 250° F. dry heat; up to 300° F. hot oil.*
3. **ABRASION RESISTANCE**—*50% greater than natural rubber.*
4. **MINIMUM COLD FLOW**—*even at elevated temperatures.*
5. **LOW TEMPERATURE FLEXIBILITY**—*down to —65° F.*
6. **LIGHT WEIGHT**—*15% to 25% lighter than many other synthetic rubbers.*
7. **AGE RESISTANCE**—*exceptionally resistant to checking or cracking from oxidation.*
8. **HARDNESS RANGE**—*compounds can be varied from extremely soft to bone hard.*
9. **NON-ADHERENT TO METAL**—*compounds will not adhere to metals even after prolonged contact under pressure. (Metal adhesions can be readily obtained when desired.)*

Hycar
Reg. U.S. Pat. Off.
American Rubber

B. F. Goodrich Chemical Company
A DIVISION OF THE B. F. GOODRICH COMPANY

This advertisement appeared in a long list of carefully selected business papers TO HELP YOU SELL parts made from HYCAR.

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Philblack O Division

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The 500 Series Polyblends

LITTLE OR NO LIQUID PLASTICIZER NEEDED; VERY SHORT MILLING TIME REQUIRED; CAN BE PERMANENTLY CEMENTED

THE new Geon polyblends are colloidal blends of GEON polyvinyl resin and HYCAR American rubber. Outstanding fact about these new materials is that the desired end results are achieved with the use of little or no liquid plasticizer.

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Combining the desirable properties of both GEON and HYCAR, the polyblends are particularly useful in applications where adhesion has been a problem. Because the HYCAR American rubber acts as a non-extractible plasticizer, conventional vinyl adhesives may be used with the finished material for a truly permanent bond.

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GEON polyblends are now being produced experimentally. They are especially designed for extruding, calendering, embossing, and press polishing. An outstanding feature of these materials is the unusually short milling time required.

They should find wide application in such fields as upholstery, shoe parts, luggage, handbags, and extruded and molded products.

Write for Information

However, it is believed that the uses for GEON polyblend will go far beyond those mentioned here. We will be glad to work with you on experimental applications. For more information please write B. F. Goodrich Chemical Company, Dept. R-8, Rose Building, Cleveland 15, Ohio. In Canada: Kitchener, Ontario.

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GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals

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VULTROL
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to prevent scorching, and for recovering
scorched stocks
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For technical data please write Dept. CB-8

B. F. Goodrich Chemical Company

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ROSE BUILDING, CLEVELAND 15, OHIO

The requirement was an inexpensive GR-S red compound stock with a Shore A hardness of 90. The use of Barrett Cumar* resin, EX grade, to solve this problem is shown in the following recipe and test data:

RECIPE	WEIGHT BASIS
GR-S	100.00
Cumar* Resin, EX Grade	50.00
Clay	225.00
Red Oxide	5.00
Zinc Oxide	5.00
Sunproof	1.00
Sulfur	4.50
Mercaptobenzothiazole	2.50
DPG	1.25
Total	394.25
Compounded Mooney Viscosity at 100° C. (1.9 Inch Rotor)	77
Specific Gravity	1.58
RHC, % by Wt.	25.4
RHC, % by Vol.	43.5
Cost per Pound	$ 0.08 (Approx.)

Cure at 316° F (70 Lb.)—10 Minutes

Tension Data:	Unaged	Aged 24 Hrs. @ 100° C
Stress—P.S.I. at 300%	750	—
Tensile—P.S.I.	850	900
Elongation—%	500	230
Hardness—Shore A	90	96

Tear Resistance (Angle Die) . . . 165 Pounds/Inch Thickness
Abrasion Resistance (duPont) . . . 720 cc. Loss/H.P. Hour
Crack-Growth Resistance (Ross-Emerson) . . . 0.00151 Inches/Kilocycle

THE USE OF CUMAR* RESINS with high loadings of clay or other types of non-black fillers provides compounds which are characterized by exceptionally good extruding and molding properties. The high hardness, low cost compound shown above illustrates only one of the many ways in which these resins can be used to great advantage. Your inquiries on the use of Cumar* resins and other Barrett Rubber Compounding Materials are invited.

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ALLIED CHEMICAL & DYE CORPORATION
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In Canada: The Barrett Company, Ltd.,
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- ***Improves processing by acting as a plasticizer at elevated temperatures***
- ***Improves tensile and elongation in specific formulations***
- ***Can be added by direct mixing in Banbury***
- ***Has excellent electrical properties***
- ***Improves tear resistance***
- ***Improves oven aging of natural rubber***
- ***In GR-S and Buna N rubbers, makes possible colored items of good durability***

For complete information and sample, write: Goodyear, Chemical Products Division, Plastics and Coatings Dept., Akron 16, Ohio.

Pliolite—T.M. The Goodyear Tire & Rubber Company

GOODYEAR

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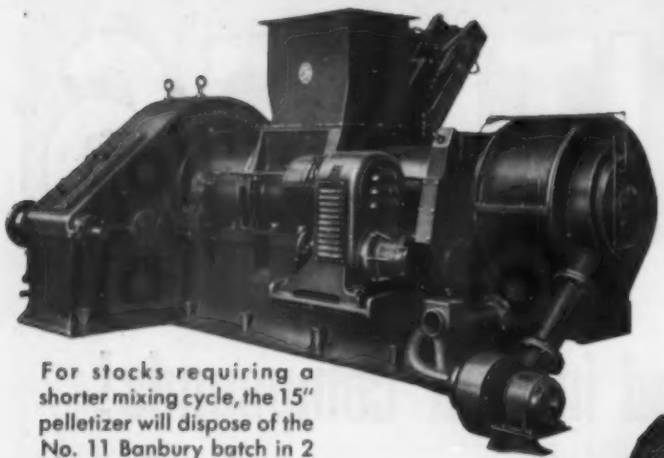
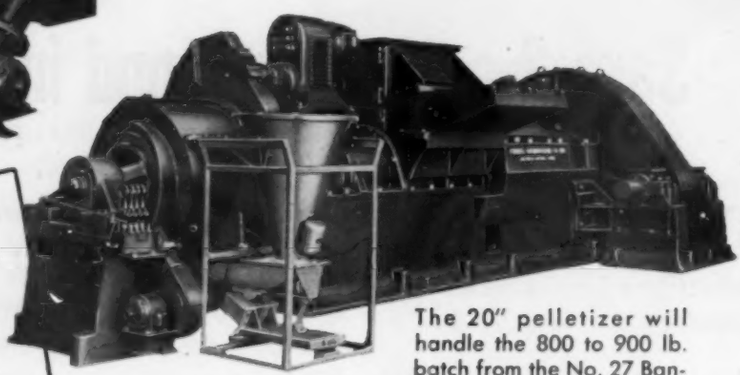
The 12" machine will dispose of the 400 to 450 lb. batch from the No. 11 Banbury in 3½ minutes.*



For stocks requiring a shorter mixing cycle, the 15" pelletizer will dispose of the No. 11 Banbury batch in 2 minutes.*



The 20" pelletizer will handle the 800 to 900 lb. batch from the No. 27 Banbury in 3 minutes.*

The Hale Pelletizer transforms bulky, hard-to-handle rubber into small, free-flowing pellets that can be *automatically* conveyed, weighed and mixed. In addition to cutting handling costs, the extra working that the stock gets in passing through the pelletizer improves the plasticity and gives better dispersion of the various ingredients.

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2 Pellets thoroughly cooled more quickly—reduces time between processing operations—less stock in process.

3 Less floor space required—floor storage and trucking eliminated.

4 Cleaner mill room — dust eliminated because pellet handling system is completely sealed in.

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Farrel-Birmingham

FB-403

*All figures are approximate; time will vary slightly depending on the type of stock, specific gravity, consistency and flow characteristics.

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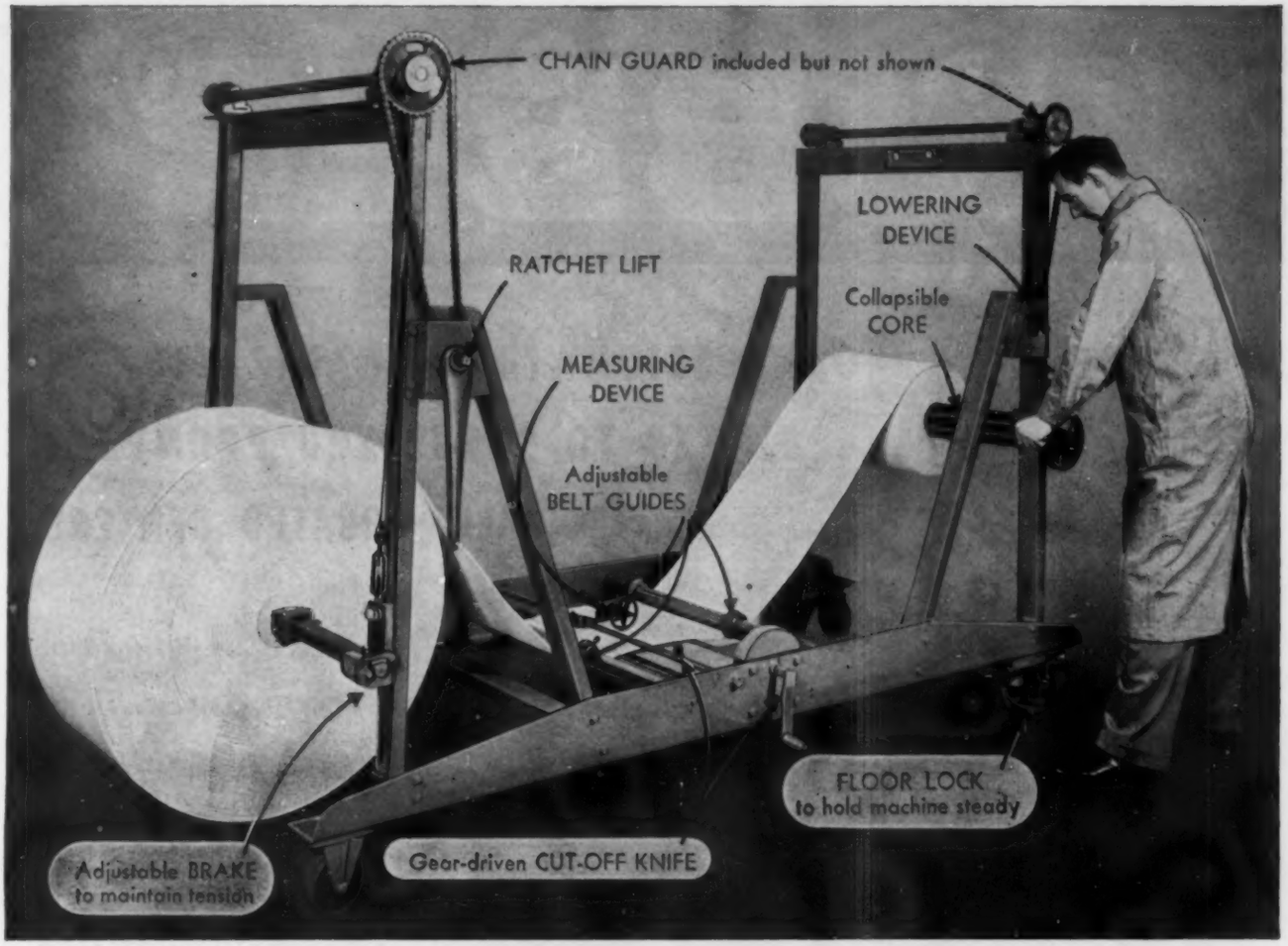

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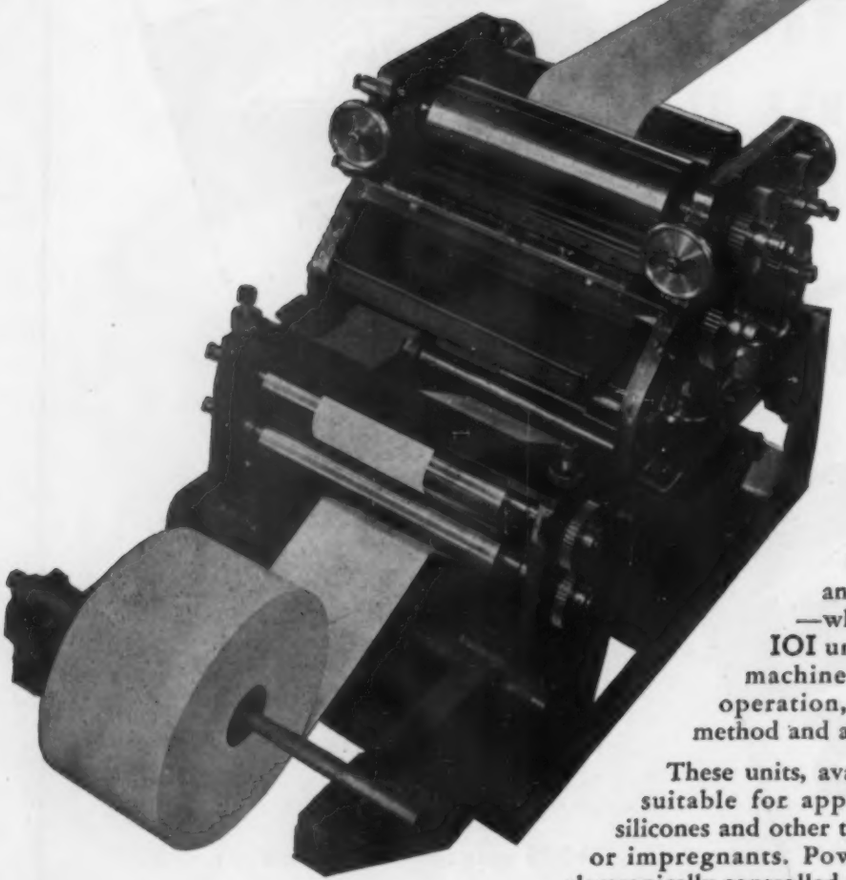

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is coated with 2% mineral oil to reduce dusting and improve dispersability in mill mixed stocks.

SHARPLES ACCELERATOR 52-2
is coated with 1% mineral oil and 4% stearic acid to further reduce dusting and to improve dispersability in mill mixed stocks.

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AS A:

VULCANIZING AGENT
PRIMARY ACCELERATOR
SECONDARY ACCELERATOR
RETARDER FOR NEOPRENE

IN:

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SPONGE RUBBER
TIRES
INNER TUBES
MECHANICAL GOODS
HEAT RESISTANT STOCKS
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SHARPLES TRADE MARK CHEMICALS

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USE COLITE CONCENTRATE... ***A High Quality Concentrated Liquid Mold and Mandrel Lubricant***

- Results in a shiny, satin-like finish.
- Never builds up on the molds.
- Is extremely *economical.*
- Is non-toxic, non-tacky, odorless.

Write today for further information on the Colite Concentrate way of removing cured rubber and plastics from molds

For brighter white goods,
Colite D43D is recommended.

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Continental's complete line of furnace and channel Carbon Blacks is specially engineered to give specific and outstanding properties to various types of rubber end products.

Such products range from footwear to mechanical goods ...from motor mountings to wire and cable jackets... from belting to bus, truck, racing and pleasure-car tires.

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CONTINENTAL CARBON BLACKS

CONTINENTAL F... hard processing channel black with average particle diameter of 20 to 25 m mu. Available either compressed or in pelletized form.

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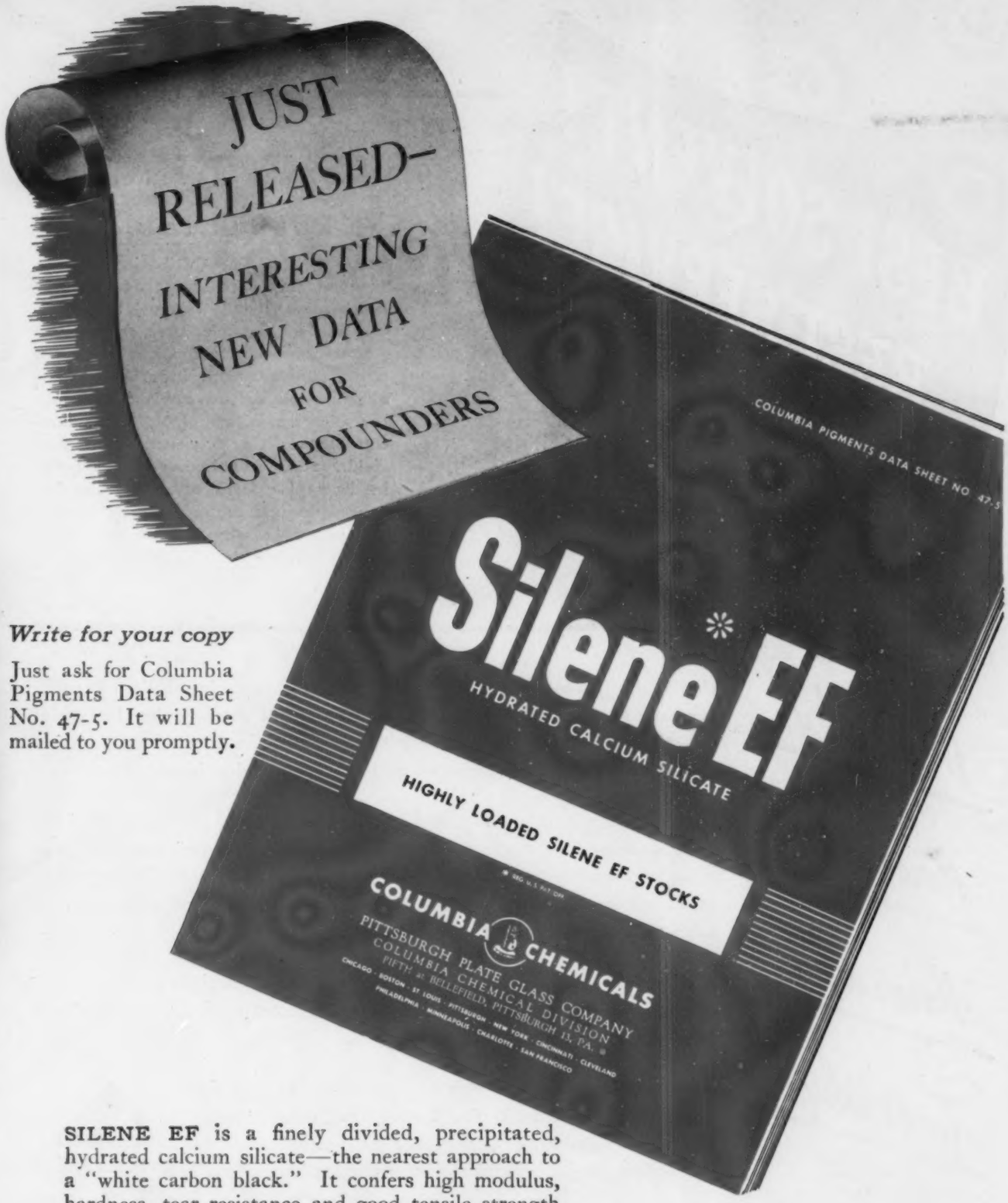

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for the RUBBER INDUSTRY

There are six different types of Skellysolve which are especially adapted to various uses in the rubber industry, for making rubber cements, and for many different rubber fabricating operations. Skellysolve offers many advantages over benzol, rubber solvent gasoline, toluol, carbon tetrachloride, etc. Our Skellysolve Technical Fieldmen have aided many manufacturers in developing formulas for new or improved products, and in "shooting" trouble of a solvents nature. Write or wire today for full information.

Here's why!

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Here's why!

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SOLVENTS DIVISION, SKELLY OIL COMPANY

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Foremost among the many factors which recommend Cabot SRF* carbon black in carcass stocks is economy. First, tire makers find highly satisfactory results without using costlier pigments. Next, overall weight of heavy-duty tires is reduced. Both of these savings are a certainty when Cabot Sterling S is used in the compound.

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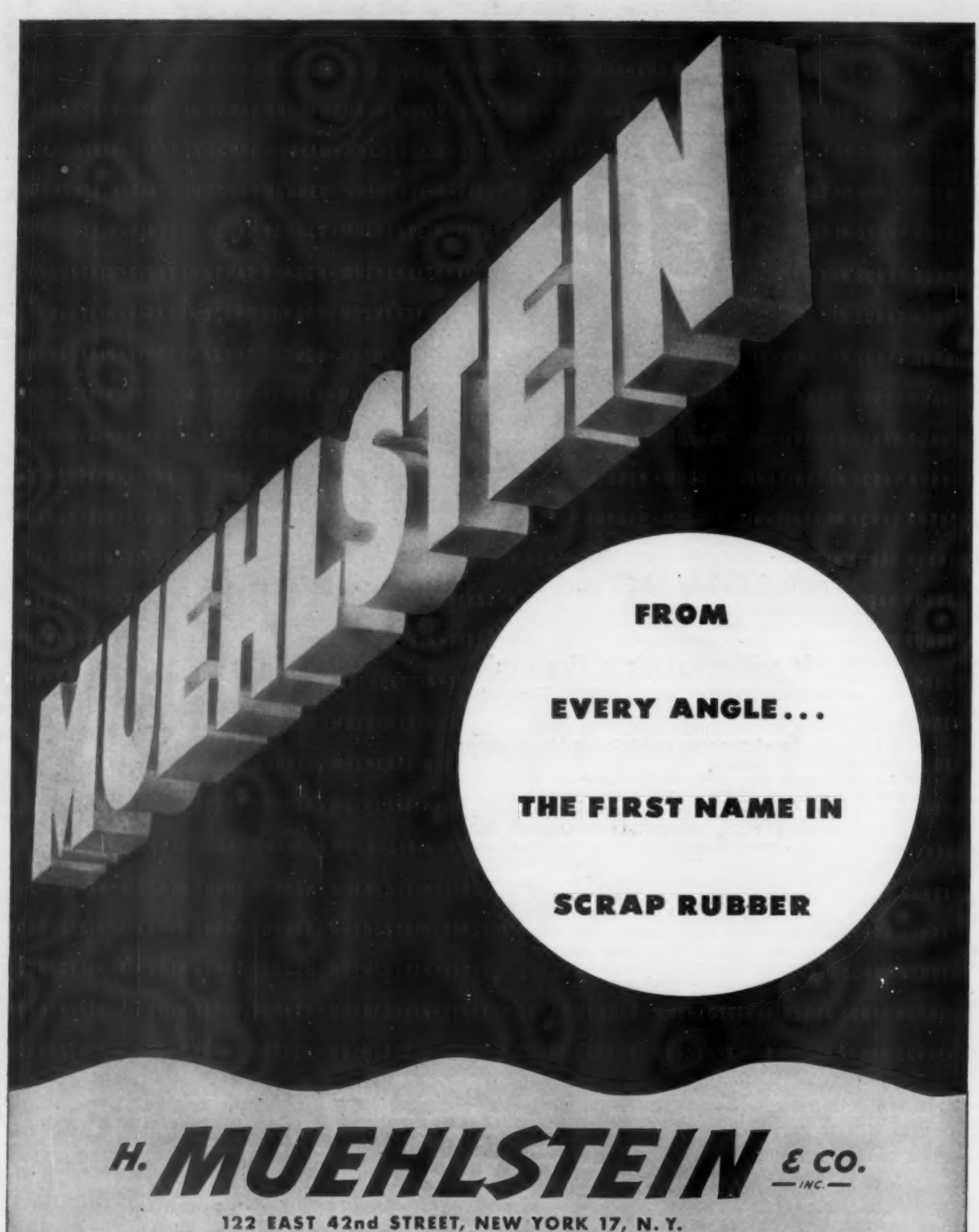
*Semi-Reinforcing Furnace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Particular emphasis is placed on uniformity of physical specifications, which reflect in trouble-free compounding of rubber products. Impurities such as iron and calcium are extremely low due to exacting chemical control.

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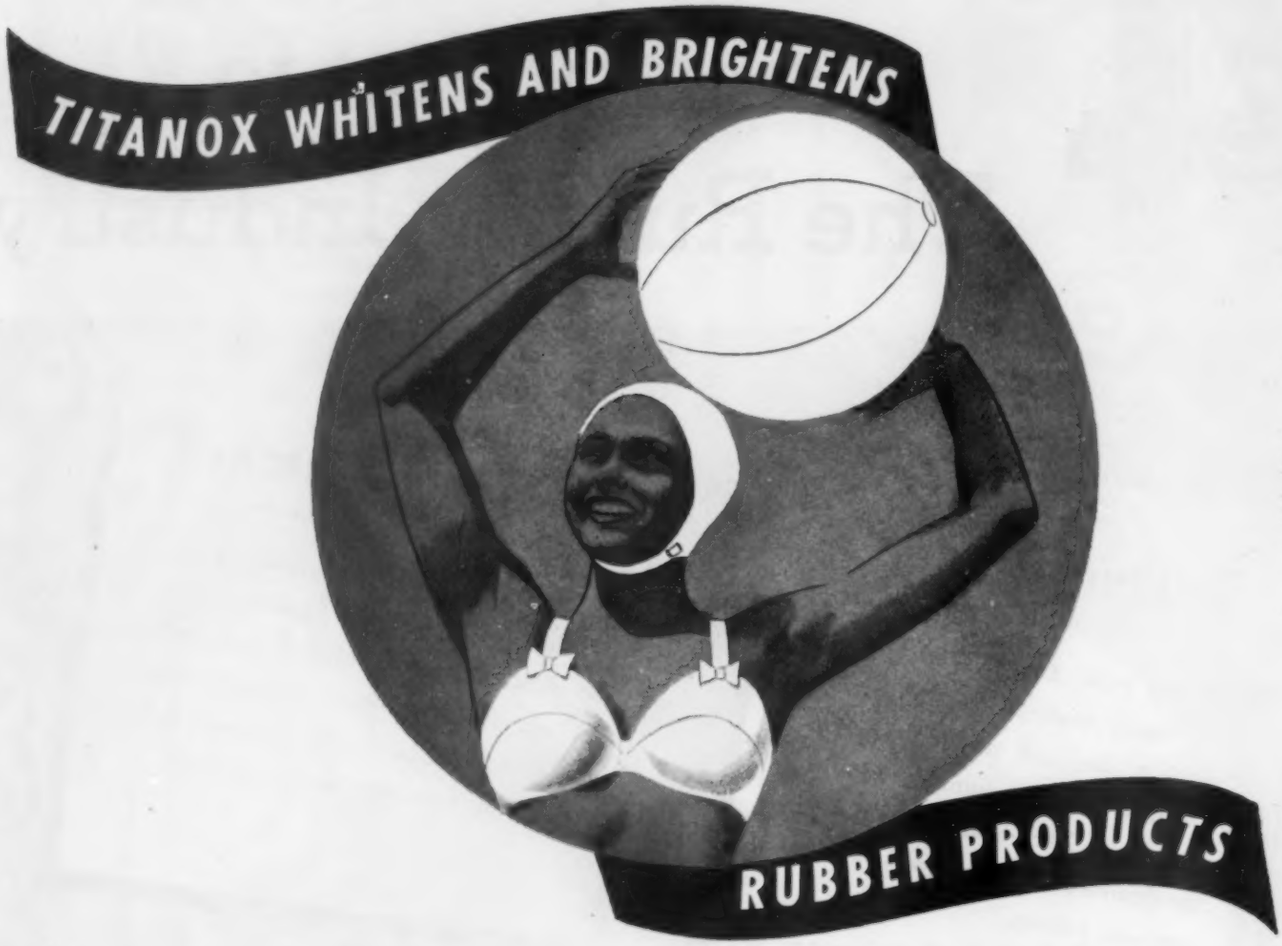

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"RECLAIMED RUBBER"

The Story of an American Raw Material

by JOHN M. BALL

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It is well illustrated with over 75 photographs and charts on all phases of reclaimed rubber manufacture and production. Included in the chapter on Manufacture is a series of interesting flow diagrams on the various commercial reclaiming processes—Digester (Alkali), Pan, and Acid.

The book contains a wealth of historical, commercial and some technical data of interest and value to the rubber manufacturer as well as to the student and others interested in the subject of rubber reclaiming.

CONTENTS

1. Early History; 2. Mitchell and the Acid Process; 3. Marks and the Alkali Process; 4. Miscellaneous Reclaiming Processes; 5. Companies and Associations; 6. Scrap Rubber; 7. Manufacture; 8. Properties and Uses; 9. Statistics; 10. World War II. Epilogue. Bibliography. Index.

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In three short years, the pioneering research of The Resinous Products & Chemical Company has resulted in basically new plasticizers for vinyl resins and elastomers which have revolutionized compounding and enlarged the use for these products. Typical of these new plasticizers now in tonnage production and widespread use are the following:

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1947 MONOPLEX 11 — An ester-type monomeric plasticizer with high efficiency and an unusual compatibility range.

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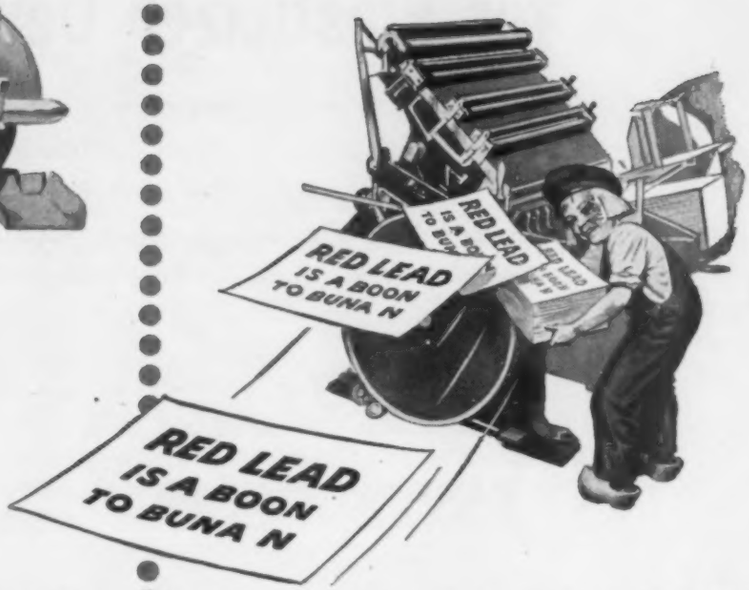


Dutch Boy: "Yes Sir . . . Red Lead is a boon to buna N products."

Plant Chemist: "But just what does it do?"

Dutch Boy: "Briefly, it gives you definitely improved properties at lower cost."

Plant Chemist: "Can you back up that statement?"

Dutch Boy: "Absolutely! Exhaustive tests, fully confirmed by the experience of users, prove beyond any question, that compounding buna N with #2 RM Red Lead gives the five, very real advantages we've listed at the right."

Plant Chemist: "Very interesting! Where can I get further information?"

Dutch Boy: "Just let us know your specific application and our technical staff will gladly supply literature and any other information you need. Drop a line to the Rubber Division of our Research Laboratories, 105 York Street, Brooklyn 1, New York."

Plant Chemist: "One more question. Is buna N the *only* rubber Red Lead improves?"

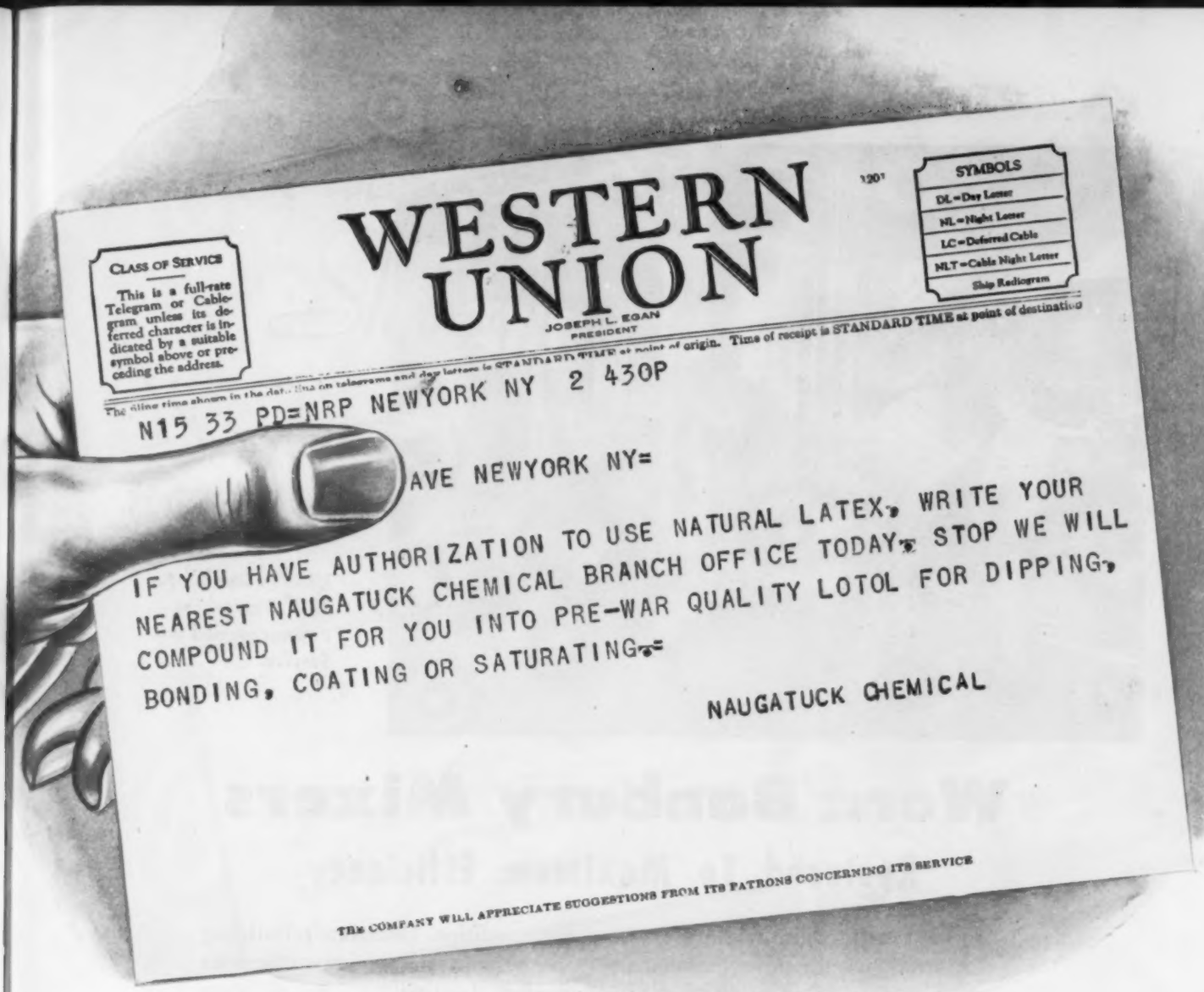
Dutch Boy: "By no means. Red Lead improves most rubber products, no matter whether your base is GR-S, GR-S-10, GR-M or GR-I. Just remember, if it's made with rubber it's better made with Red Lead."

CHECK THESE 5 REASONS FOR COMPOUNDING BUNA N WITH #2 RM RUBBER RED LEAD

1. *Greatly Improved Heat Stability*
   - *a) Retention of modulus*
   - *b) Retention of elongation*
   - *c) Retention of hardness*
2. *Decreased Cost*
3. *Improved Water Resistance*
4. *Excellent General Physical Properties*
5. *Safe Processing*

NATIONAL LEAD COMPANY—New York 6; Buffalo 3; Chicago 8; Cincinnati 3; Cleveland 13; St. Louis 1; San Francisco 10; Boston 6, (National Lead Co. of Mass.); Philadelphia 7, (John T. Lewis & Bros. Co.); Pittsburgh 30, (National Lead Co. of Pa.). Charleston 25, West Virginia, (Evans Lead Division).

If it's made with buna N ... it's better made with RUBBER RED LEAD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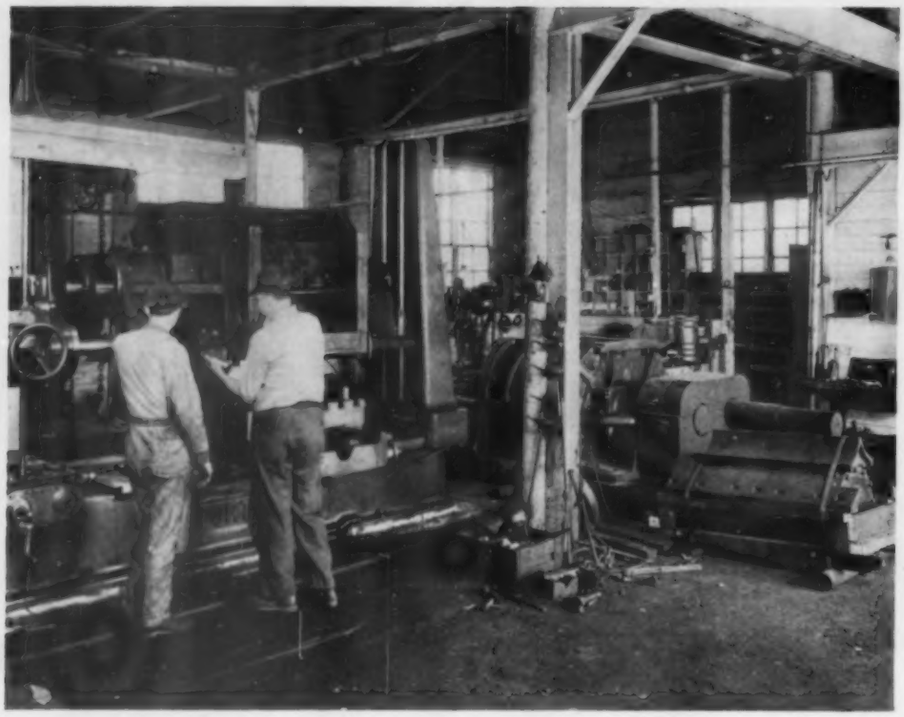

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Restored To Maximum Efficiency

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Main Plant: 914 Miami Street AKRON 11, OHIO Phone: JE 7970

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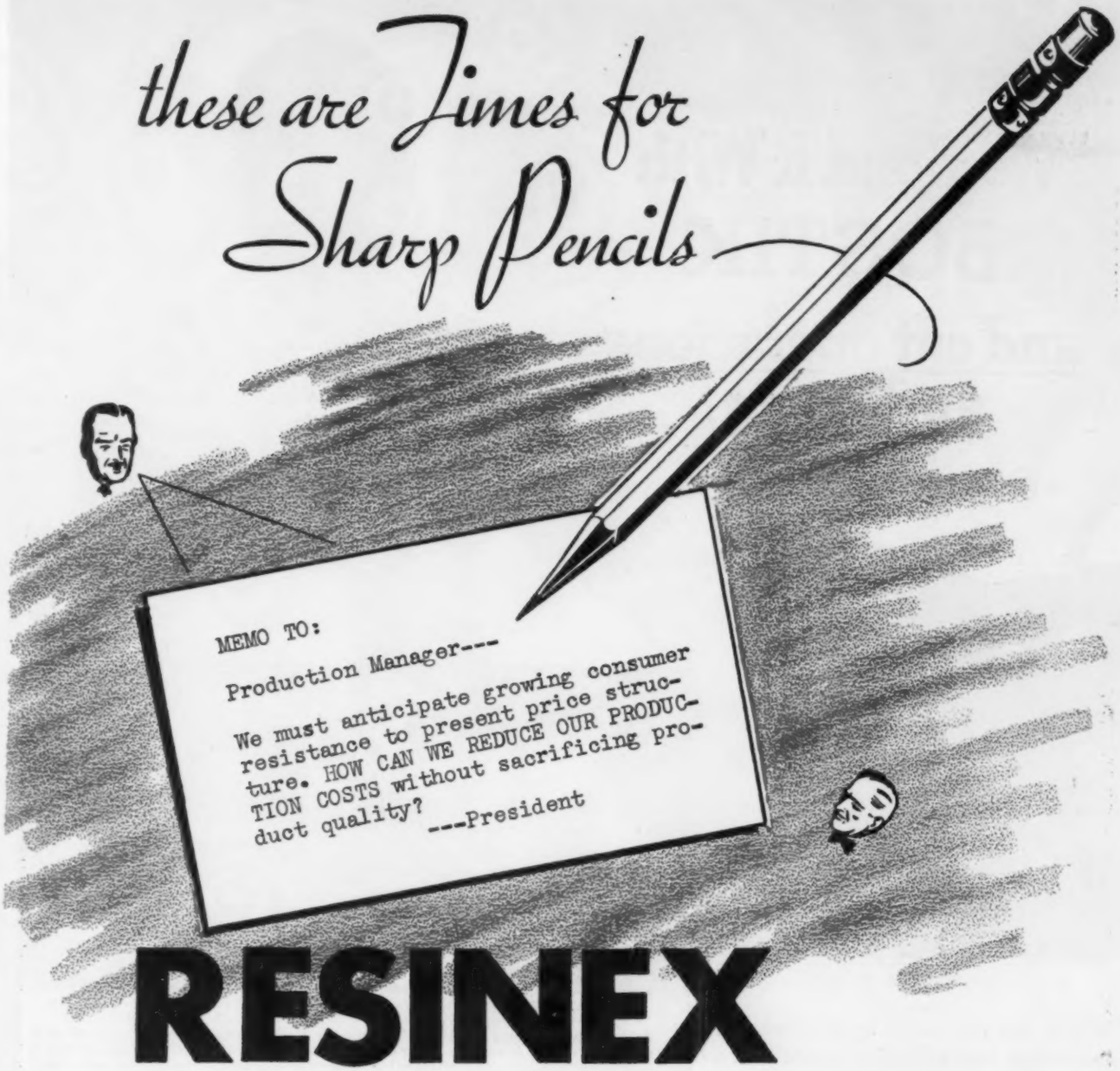
these are Times for Sharp Pencils


MEMO TO:
Production Manager---
We must anticipate growing consumer resistance to present price structure. HOW CAN WE REDUCE OUR PRODUCTION COSTS without sacrificing product quality?
---President

RESINEX

Check the possibilities of RESINEX for cost reduction and product improvement . . . This series of aromatic resins has brought new economies into many plant operations by facilitating the extension of more costly compounding materials . . . It helps speed up incorporation in both open mill and Banbury . . . It gives better pigment dispersion and smoother stocks . . . It improves resistance to flex-cracking and cut-growth . . . It gives higher tensile with better elongation and tear properties . . . It gives better mold flow with less sticking . . . IT IS ECONOMICAL IN COST and is READILY AVAILABLE FOR ALL PURPOSES.

Write today for New RESINEX Bulletin

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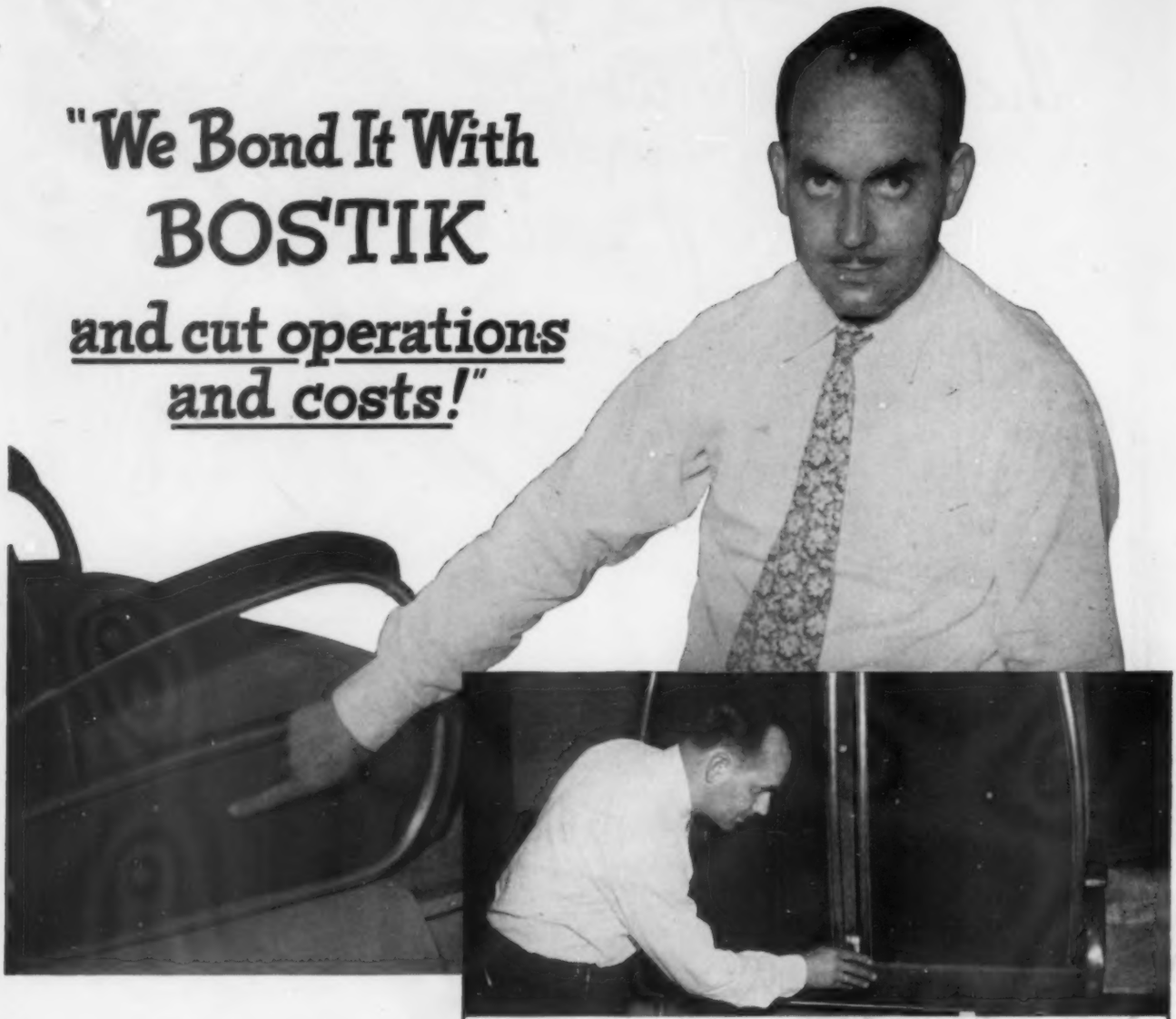
"We Bond It With BOSTIK and cut operations and costs!"



Pointing out toe guard bonded with Bostik, Mr. Radigan states: "Bostik really speeds up the job — does it better at lower cost. We spray it on, instead of brushing it on as with former adhesives. We can apply it over any type of surface, something we could not do before. Moreover, Bostik can stand overnight and be used the next day without appreciable loss in its positive adhering qualities. This amounts to a substantial saving over old types."

"We've cut our costs by eliminating operations and adhesive waste since swinging over to Bostik *Customized* Adhesives," says Mr. Paul Radigan, Assistant Superintendent of Transportation Seating, Heywood-Wakefield Company.

This large Gardner, Massachusetts, furniture company bonds fabric-reinforced vinyl plastic to steel with Bostik, in the manufacture of armrest panels and toe guards for railway coach seats.

"When adhesives we formerly used for this work failed to stand the 'gaff,' we learned about Bostik — and we've used it with great success ever since."

Whatever combination of materials *you* wish to bond, there is a Bostik *Customized* Adhesive that will do the job . . . will bond any material to any material, in any combination.

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now available in larger quantities

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a Series of Para–Coumarone Indene Resins

now available
in flake form as well as solid

Expanded manufacturing facilities have made available larger supplies of PICCOUMARON RESINS. Prices remain at about pre-war levels.

Piccoumaron Resins are furnished in ten standard melting points, varying from liquids to brittle solids.

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correct type of steel drums

prices remain
at about pre-war levels

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Plant men also like the way Santoflex B melts and flows into the rubber stocks to give a uniform dispersion at milling temperatures.

For further information on this superior antioxidant, write to MONSANTO CHEMICAL COMPANY, Rubber Service Department, Second National Building, Akron 8, Ohio.

Santoflex B: Reg. U. S. Pat. Off.

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TREMENDOUS WATER POWER
LOW ELECTRIC RATES
LEADER IN LUMBER
BASIC METALS AND ORES
LARGE AGRICULTURAL YIELD
SOURCE OF SEA FOOD
GATEWAY TO THE ORIENT
EXCELLENT TRANSPORTATION
FAST GROWING POPULATION
SCENIC WONDERLAND

* *One of a series of advertisements based on industrial opportunities in the states served by the Union Pacific Railroad.*

WATER POWER is one of Washington's most important industrial advantages. Two of the world's greatest dams, Grand Coulee and Bonneville, make it possible to offer industry unusually low electric power rates.

Lumber, coal, iron, nickel, chrome, aluminum —and other basic metals—are available "on the ground floor" for industrial purposes.

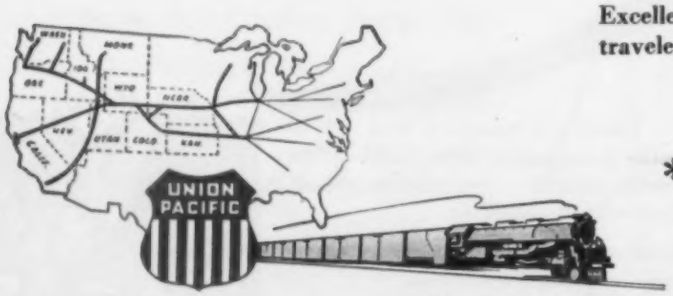
The state's tremendous yield of fruits and vegetables, together with seafood, offers an immediate supply to concerns engaged in processing and packing.

Washington's population has shown a great growth; providing a large local consumer market and source of industrial workers.

The state also is a gateway to the Orient for export business.

From a viewpoint of good living, the Evergreen State offers a year 'round scenic playground . . . excellent educational and cultural advantages.

Excellent rail transportation, for shippers and travelers, is provided by Union Pacific.



* *Address Industrial Department, Union Pacific Railroad, Omaha 2, Nebraska, for information regarding industrial sites.*

UNION PACIFIC RAILROAD

THE STRATEGIC MIDDLE ROUTE

Are you converting your mechanical goods compounds to natural rubber?

INDONEX plasticizers

will help you keep volume costs down while obtaining desired quality.

The four compounds tabulated below illustrate quality obtainable using high loadings of carbon black, with INDONEX for smooth processing, good aging, etc.

For various products these formulations can be cheapened by partial replacement of carbon black with low cost fillers.

Smoked Sheets	100	100	100	100
EPC Black	35	100	—	—
SRF Black	25	—	125	—
MT Black	25	—	—	—
HMF Black	—	—	—	100
Zinc Oxide	5	5	5	5
Stearic Acid	1	1	1	1
INDONEX 639½	20	35	35	35
Sulfur	3	3	3	3
Benzothiazyl Disulfide	1	1	1	1
BLE Powder	1	1	1	1
	216	246	271	246
Sp. Gr.	1.23	1.21	1.25	1.20
Original Tests*				
Modulus, 200%	731	420	800	1115
Tensile, psi	1922	1910	1630	1590
Elongation, %	466	600	448	300
Hardness	59	56	58	61
Tear, lbs.	382	315	285	199
Comp. Set (30%-ASTM "B") (22 hrs. at 158°)	32	44	24	28
Oven Aged, 70 Hrs. at 212°F.*				
Modulus, 200%	1460	1000	1310	—
Tensile, psi	1685	1182	1424	1232
Elongation, %	250	250	225	169
Hardness	74	74	68	72
Tear, lbs.	226	239	290	156

*Avg. of 6 or 8 cures at 316°F. except Comp. Set which is on 25 min. cure

INDOIL
CHEMICAL PRODUCTS

Don't reconvert by merely going back to prewar formulas. Let INDONEX help you to lower volume costs while retaining desired quality.

STANDARD OIL COMPANY (INDIANA)
CHEMICAL PRODUCTS DEPT.
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COUMARONE RESINS
ALKYLATED PHENOL RESINS
PLASTICIZING OILS
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THE NEVILLE COMPANY
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Chemicals for the Nation's Vital Industries

A-25

Technical Bulletin No. 35 — on the Compounding of GR-S with Substantial Loadings of ZINC OXIDE

XP-36C (Monochlorostyrene Polymer) with 100 Parts of Zinc Oxide

XP-36C is defined by *Office of Rubber Reserve* as follows: *71 butadiene—29 monochlorostyrene, fatty acid soap emulsification, salt acid coagulation, 62 Mooney, PBNA Stabilizer.*

COMPOUND NO. 35	
Polymer	100.0
Sulfur	3.5
MBTS	1.0
DPG	0.1
Coumarone-indene Resin	7.5
E.L.C. Magnesia	5.0
ZINC OXIDE	100.0

ORIGINAL RESULTS

Time of Cure Min. at 45 Lb.	Tensile Strength (psi)	Per Cent Elongation	Modulus Load (psi) for Elongation of: 200%	300%	400%	500%	Permanent Set	Shore Hardness	Tear Resistance Tested at: Room Temp.	100°C.
GR-S										
7.5	40	1435	40	40	40	40	1.56	30	13	5
15	1980	770	190	230	305	455	.33	46	50	33
30	2040	650	235	275	430	705	.36	50	50	33
45	1190	560	200	315	435	750	.23	51	53	35
60	1230	560	240	315	475	790	.25	52	50	33
90	1570	580	235	315	470	860	.28	52	53	35
XP-36C										
7.5	1780	800	160	240	275	395	.31	47	53	35
15	2500	720	240	275	435	750	.42	52	62	38
30	1800	605	240	360	520	920	.33	53	60	35
45	1560	580	240	360	560	1000	.30	54	59	35
60	1700	575	275	395	595	1150	.30	54	59	35
90	1530	550	275	430	665	1255	.27	54	57	35

Time of Cure Min. at 45 Lb.	Goodyear-Healey Pendulum: Indentation in mm.	Per Cent Rebound	Hardness: Shore	Rex	Compression Fatigue (Goodrich Flexometer)*: Per Cent Initial Comp.	Running Time and Per Cent Permanent Set	Max. Temp. Rise °C.	Dynamic Compression: Initial	Final	Cut-Growth Resistance Tested at 70° C. Inches Failure: 400 Cycles	1600 Cycles
GR-S											
60	7.90	63.8	50	53	27.2	82'-35.8	85.4 (At 15'-27.5)	18.9	43.5	.45	.73
XP-36C											
60	7.66	64.4	53	56	24.3	35'-17.3	39.0 (At 15'-30.5)	15.1	28.3	.25	.75

* Test Conditions: 143 Lb. Load. 0.175" Stroke. 100° C. Oven Temp.

RESULTS with the dichlorostyrene polymer—XP-8 in Zinc Oxide compounds were reported in *Technical Bulletin No. 32*, in comparison with Standard GR-S. XP-8 gave the highest all-round physical properties with Zinc Oxide of any of the experimental polymers reported to date. Since monochlorostyrene may be more readily available and at lower cost than dichlorostyrene, XP-36C polymer was prepared for evaluation.

While the tensile and tear results with XP-36C are somewhat lower than XP-8 (Technical Bulletin No. 32), the results are generally better than Standard GR-S and the other modifications. The rebound for XP-36C is higher than XP-8 but the compound shows more compression fatigue.

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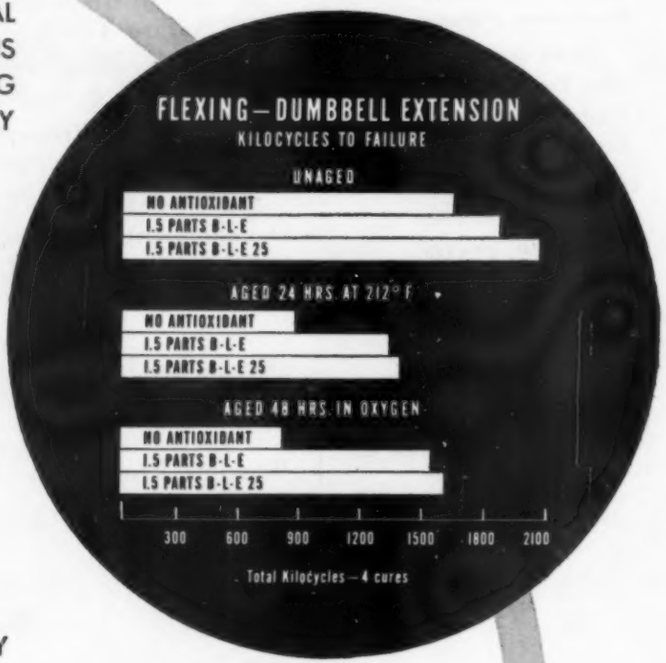

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RUBBER AGE

Vol. 61, No. 5 AUGUST, 1947

Softeners for GR-S Tires

II—Evaluation of Combinations of Carbon Black and Plasticizer as Extending Agents for GR-S Tire Treads

By F. M. McMILLAN*, V. V. WHEELER†, and B. O. BLACKBURN*

THE work to be described in the present paper consists of a special set of tire tests, forming a part of the test program described in the preceding section (see note) and designed to evaluate a graded series of tire-tread compounds containing successively larger amounts of an "extender-type" plasticizer, together with carefully proportioned increments of reinforcing agent to hold the physical properties of the stock as nearly constant as possible.

Definition of an Extender

By definition, an extender is a material which can be added to a base compound in reasonably large amounts without seriously altering its physical properties. Few if any of the common materials described as extenders for natural or synthetic rubbers really meet this qualification; the majority are viscous liquids or gums with a definite softening effect, so that as increasing amounts are added there is a definite trend toward softness and stickiness in the uncured stock and toward low modulus and low strength in the vulcanizate, even if the same allowance of curing and reinforcing agents is made for the extender as for the rubber.

It was early recognized that it is more logical to make such an allowance, i.e., to treat the extender as a partial replacement for the rubber, rather than to use it simply as an additive; and from this it was an obvious step to recognize that a different and usually higher proportion of reinforcing agent is required for the extender than for the rubber. The true extender in such cases is really the combination of "extender-type" plasticizer and reinforcing agent in a predetermined ratio, regardless of whether the materials are actually premixed or added separately.

This principle has been recognized by several authors, and the filler-plasticizer ratios required to hold certain physical properties constant have been carefully worked out for certain specific cases, notably by Schwarz *(1)*, the Columbian Carbon Company *(2)*, Grote and Rostler *(3)*, and Sperberg et al *(4)*.

The use of such combinations is of course economically attractive and in addition offers definite advantages in certain other respects, notably in processing characteristics. However, for successful practical utilization of systems of this sort in critical applications such as tires, it is not sufficient that a few properties such as tensile strength, modulus, and hardness shall be unaffected by the addition of the extending agents; many other properties that affect tire performance, i.e., resilience, hysteresis, cut-growth resistance, and abrasion resistance, must also be kept at satisfactory levels.

In the specific case of GR-S tires, it may be assumed that the reinforcing agent will be carbon black, and for successful extending action it will therefore be necessary to employ a plasticizer that will counteract not only the marked stiffening action of carbon black but also its adverse effects on resilience and hysteresis. Conversely, the high reinforcing power of the carbon black will compensate for the softening and weakening effect of the plasticizer, and a similar balancing action can be expected in a number of other properties.

From the foregoing it is apparent that the heavy asphaltic and resinous plasticizers would not be ideally

* Shell Development Co., Emeryville, California.
† General Tire & Rubber Co., Akron, Ohio.

Note: The first of these papers, "An Evaluation of Nine Softeners in GR-S Tire Treads," by V. V. Wheeler, R. M. Vance, F. M. McMillan, and B. O. Blackburn, was published in the July, 1947, issue of RUBBER AGE.

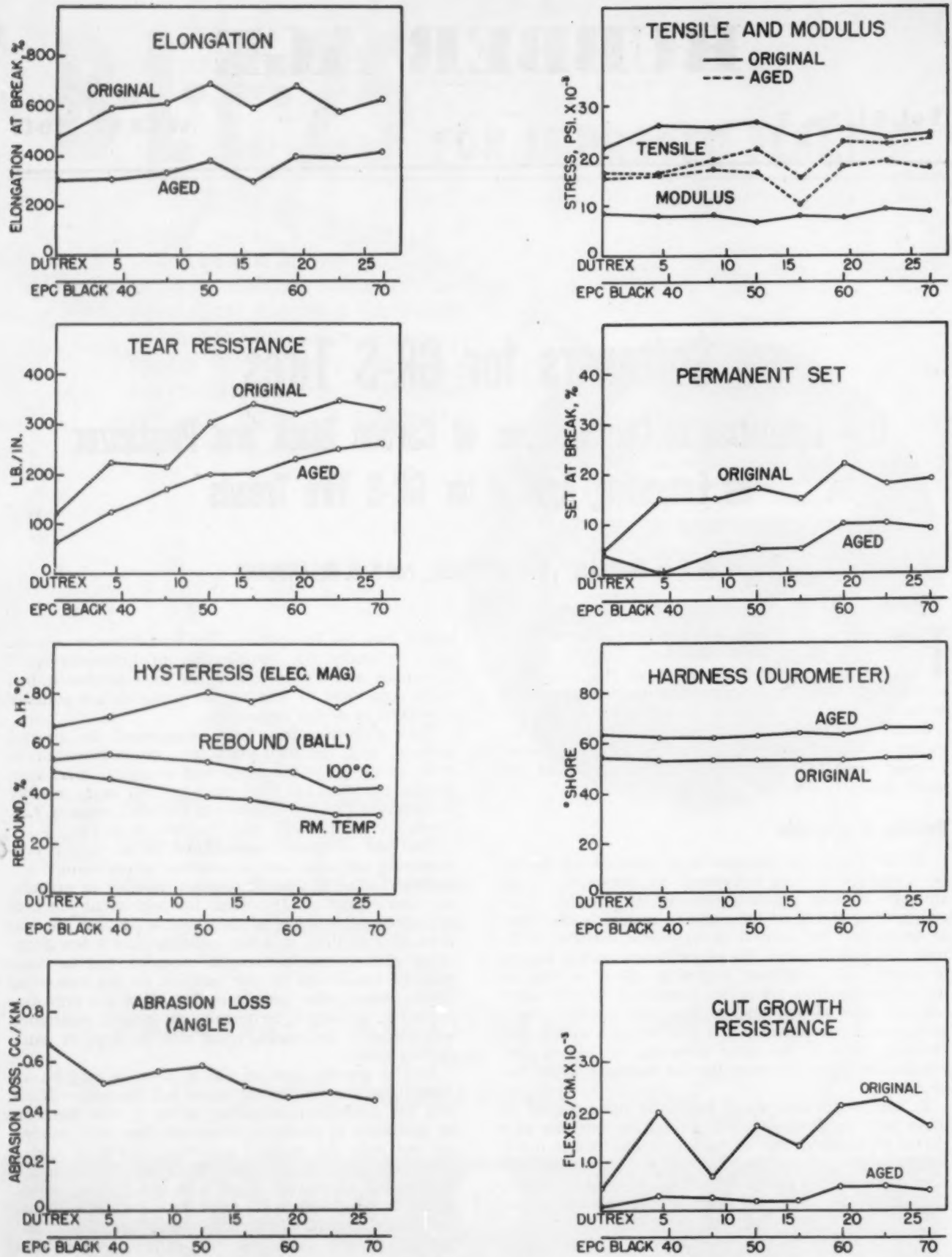

FIG. 1—Effect of increasing proportions of softener and EPC black on physical properties of GR-S tread stock (laboratory-mixed batches).

suited for use in combination with carbon black in extending GR-S tire compounds, since their effect on resilience and hysteresis is either neutral or adverse. On the other hand, a low-molecular-weight plasticizer such as a light oil, while improving hysteresis, will have a disproportionate weakening effect, requiring an excessively high carbon-to-plasticizer ratio.

A number of attempts have been made to develop satisfactory tire compounds containing high plasticizer loadings and, in certain cases, high carbon loadings, although relatively few reports of such work have appeared in the regular literature. In some cases, the road test results have been disappointing, and the general impression has been gained that such compounds suffer from poor hysteresis and inadequate abrasion resistance. This is undoubtedly correct in those cases where the particular plasticizer used has proved to be unsuitable or where the ratio of extender-plasticizer to reinforcing agent has not been accurately adjusted to balance the opposing effects.

Based on such general considerations and on extensive commercial experience in other fields, there appeared to be a good possibility that a successful extending agent for GR-S tire treads could be worked out using a combination of EPC or HMF black with the viscous-liquid, unsaturated petroleum hydrocarbon type of plasticizer, providing the proper proportions were carefully determined. Plasticizers of this type are known to have minimum weakening effect on GR-S vulcanizates, yet they definitely improve hysteresis and also tend to balance out the other effects of added carbon black on a GR-S tread stock.

As a preliminary to road tests on such a combination, it was necessary to carefully work out the precise ratio of carbon to plasticizer that would cause the least over-all change in the important properties of the vulcanizate. This was done for two types of compounds: a GR-S passenger-tread stock, for which the base recipe contained 45 parts of EPC black and 9 parts of softener, and a truck-tread stock whose base recipe contained 52 parts of HMF black and 5 of softener.

For each series the optimum ratio of added carbon to added plasticizer over the base recipe was determined by successive approximations in laboratory compounding studies. This work resulted in the choice of an incremental carbon to incremental plasticizer ratio of 1.43 for the EPC black series and of 1.6 for the HMF black series. An extensive range of compositions was then tested in the laboratory as a check on the accuracy of the chosen ratios in maintaining a constant level of physical properties.

TABLE I—RECIPES FOR PASSENGER TIRE TREADS

Base Recipe

GR-S	100.00
Zinc Oxide	3.00
Stearic Acid	1.00
Age Resistor	.80
N-Cyclohexyl-2-benzothiazole-sulfenamide	1.30
Sulfur	1.75

Carbon and Softener

Dutrex 6	0	4.5	9	12.5	16	19.5	23	26.5
EPC Black	32	38.5	45	50	55	60	65	70

Ratio, added carbon/added softener = 1.43

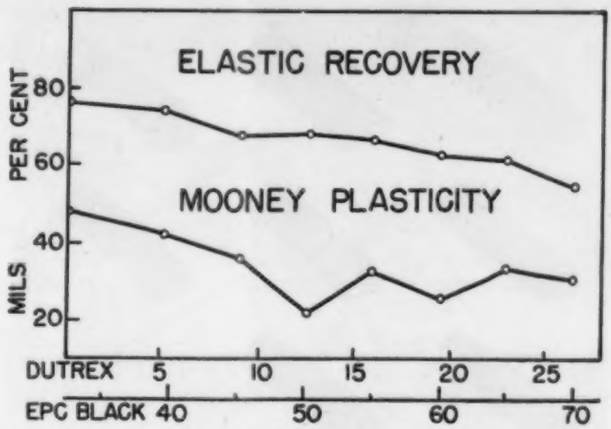

FIG. 2—Effect of increasing proportions of softener and EPC black on processing characteristics of GR-S tread stock (laboratory-mixed batches).

Passenger Tread Tests

The recipes used for the passenger tire treads are shown in Table I. This series extended both directions from the base compound, going back to zero softener with 32 parts of carbon and up to 26.5 parts softener with 70 parts of black.

The test data on these compounds are plotted in Figure 1 as a function of composition. The curing rates of these compounds proved to be similar, and the 60-minute cure at 145° C. (293° F.) was chosen as the optimum for these comparisons.

It will be noted that tensile strength, modulus, and hardness were held very satisfactorily at constant levels over the entire range of compositions. Aged tensile appeared to be better for the highly extended compounds. Tear resistance and cut-growth resistance, both before and after aging, also showed improvement. Rebound showed a decline with increasing loading, and hysteresis showed an increase in the early members of the series (up to 50 parts carbon) but little further change at higher loadings. Surprisingly, abrasion loss (on a modified angle abrader) did not show an increase with the more highly extended compositions; in fact the general trend was downward. The New Jersey Zinc abrasion test was not performed on these compounds, since the testing of these laboratory-mixed batches was carried out at one laboratory only; however, both abrasion tests were performed on the final factory-mixed stocks, as described below.

As would be expected, the nerviness of the compounded stocks decreased steadily with increasing total loading. This is illustrated in Figure 2, in which elastic recovery is plotted against composition. The values for elastic recovery shown here were determined by sheeting the stock through the mill at a fixed setting and measuring the area of the sheet after allowing sufficient time for the elastic recovery to take place. From the known density of the stock the theoretical area for a completely "dead" stock with zero nerve can be calculated, and the departure from this theoretical area is taken as a measure of nerviness of the stock. Thus, the less the nerve the lower the recovery figure.

From Figure 2 it appears that there is an approximately linear decrease in elastic recovery as the total loading is increased, and this of course constitutes one

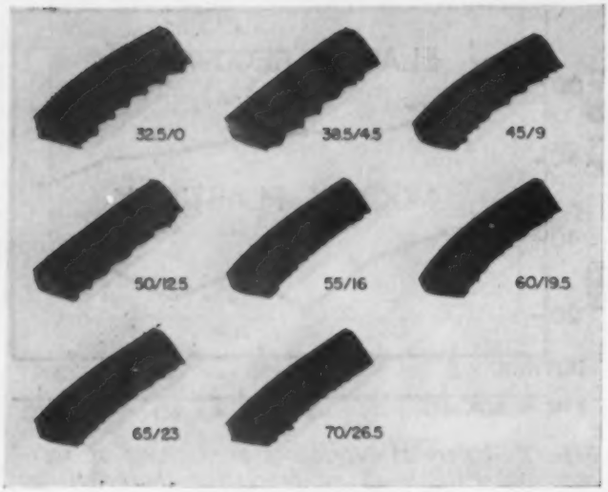

FIG. 3—Extruded sections from GR-S tread stocks with increasing proportions of softener and EPC black.

of the chief advantages of this type of compounding from the processing standpoint.

The Mooney plasticities of the unvulcanized stocks are also plotted in Figure 2 as a function of composition. Although the curve is somewhat irregular, there appears to be a downward trend in the first few members of the series, followed by a fairly constant value.

As a further indication of the processing characteristics to be expected from these compounds, samples were extruded under constant conditions through a No. ½ Royle tuber using a Garvey die *(5)*. Photographs of the extruded sections are shown in Figure 3, in which the smoother surfaces, sharper edges, and lower swell of the more highly extended compounds are readily apparent.

As a practical range of compositions for road testing, the middle portion of this series was chosen, covering the region from 9 to 19.5 parts of softener and from 45 to 60 parts of EPC black. This gave a group of four compounds in which the total loading was increased over that of the base compound by 25½ parts per hundred of GR-S, in uniform increments of 8.5 parts, comprising 3.5 parts softener and 5 of black. It was felt that this group would cover the range of practical interest for tire compounding and would extend into the region where road wear should begin to suffer from too low a rubber content. In practice, however, this did not prove to be the case, and it is now apparent that the inclusion of still more highly extended compounds in the road tests would have been desirable.

The factory compounds of these four compositions were mixed and experimental tires with half-and-half treads were constructed in the same manner as described in the preceding section of this paper. The same control stock used in the first study was employed in this series, consisting of a blend of gum turpentine, coal tar, and pine tar, and each compound of the experimental group was rated against this control. Samples of the factory stocks were tested in both laboratories, giving the results shown in Figure 4. (Data are for the 60-minute cure at 145° C.).

The effects obtained in the laboratory compounding studies were largely confirmed in these factory-mixed stocks, although there are some interesting differences. Fairly uniform levels of tensile strength, modulus, elongation and hardness were maintained. There was some indication of a "peaking" in the tear curve, although tests in the two laboratories [Shell ("S") and General ("G")] by slightly different methods gave somewhat different results.

The downward trend in resilience was confirmed, and an upward trend in hysteresis was observed in the electromagnetic flexometer; however, in the St. Joe flexometer the highly extended compounds were not significantly worse than the control. Cut-growth resistance improved as the total loading was increased.

The abrasion tests gave interesting although conflicting results; on the New Jersey Zinc abrader there was a definite trend toward higher abrasion loss with increasing total loading, whereas on the modified Akron angle abrader the most highly loaded stock was just as good as the control. This made it of particular interest to determine the relative ratings of this series of tires in respect to actual road wear.

Construction of the half-and-half-tread, 6.00-16 passenger tires, their distribution, and the methods of testing, reporting, and interpreting the results were exactly the same as those described in the first section of this paper. Ten tires of each construction were tested and these were distributed among nine geographical areas. The road wear results are given in Figure 5, which shows the ratings based both on the final tread depth readings (Method 1) and on the complete plot of experimental vs. control readings (Method 2) as previously described.

There was some decrease in road life in going from 9 to 12.5 parts softener; however, further increases in loading caused little or no further decrease, and even the compound containing 19.5 parts softener and 60 of carbon, which had been expected to show an appreciably reduced road life, proved fully equal to the control stock. Thus, the steady decrease in abrasion resistance predicted by the New Jersey Zinc abrasion test did not show up in the road test, and the uniform abrasion for all four compounds indicated by the angle abrader was more nearly in keeping with actual road performance.

The equal wear obtained from the most highly extended stock and from the base stock is illustrated in Figure 6, which shows photographs of a typical pair of test tires. This particular set was tested at Brooklyn, New York, and was photographed at 22,193 miles. Both the experimental and control halves are shown, and it is evident that in this particular set the rate of wear for the base stock containing 9 parts of unsaturated petroleum softener and 45 parts of carbon was little different from that of the highly extended stock, containing 19.5 parts of unsaturated petroleum softener and 60 parts carbon; and that both were slightly superior to the control compound. In addition, it should be noted that there is no indication of any cracking or chipping in the extended compound.

Road performance of these tires was entirely satisfactory, and blow-outs were no more frequent in this group than in the conventional stocks. (Actually, one tire of the ten made with the most highly extended compound failed by a blow-out, whereas there were two blow-outs in the set made with the base recipe.) As was indicated above, it is now apparent that road

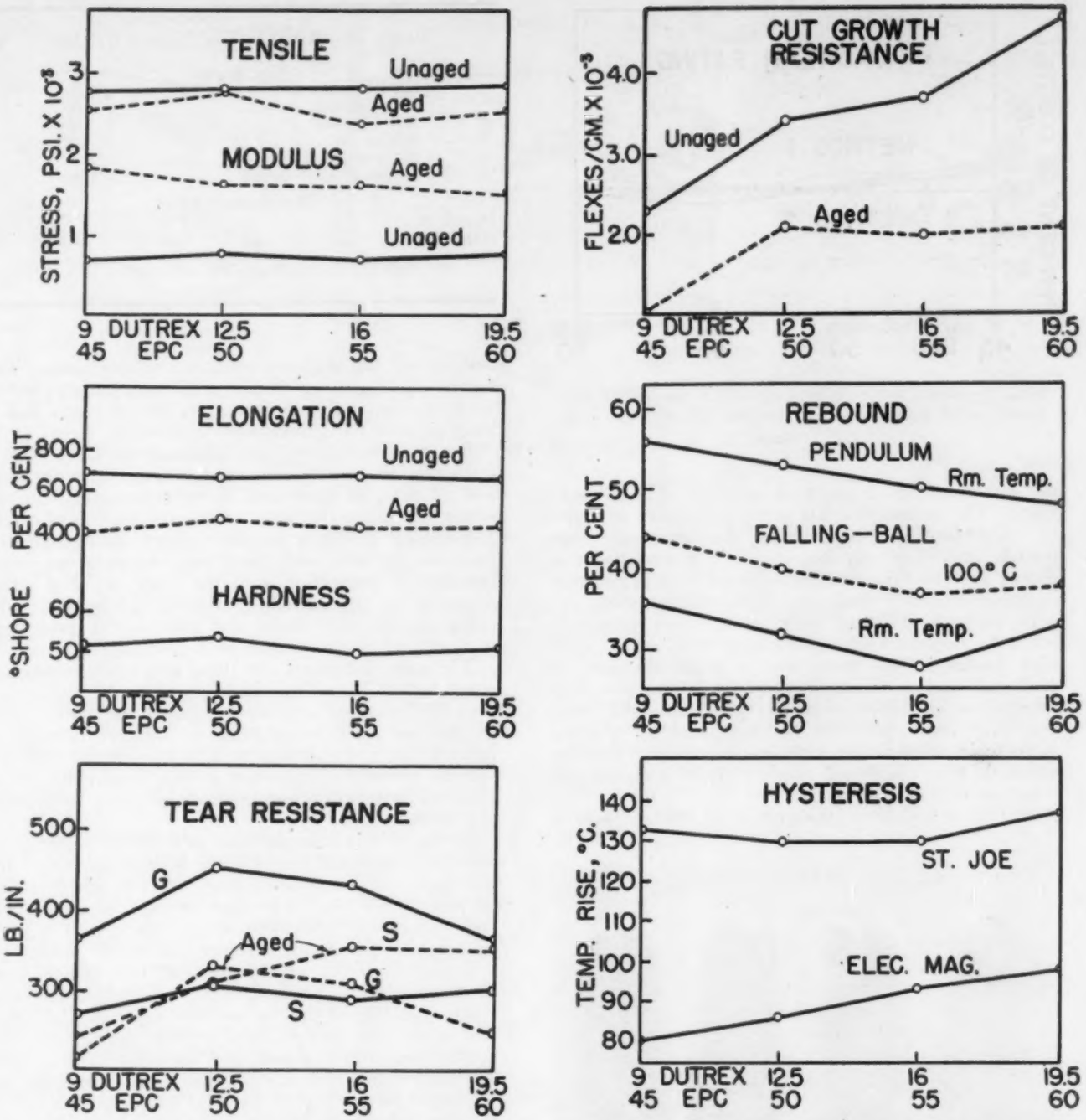

FIG. 4—Properties of factory-mixed stocks used in passenger tire road tests.

testing of still more highly extended compounds would have been of considerable interest in order to determine the point at which a definite decline in wearing quality would appear.

Truck Tread Tests

Turning now to the truck tread series, starting with the base recipe of 52 parts HMF black and 5 parts softener, a similar series of laboratory compounds was prepared, going back to zero softener with 44 parts black and out to 20 parts softener with 76 parts black, us-

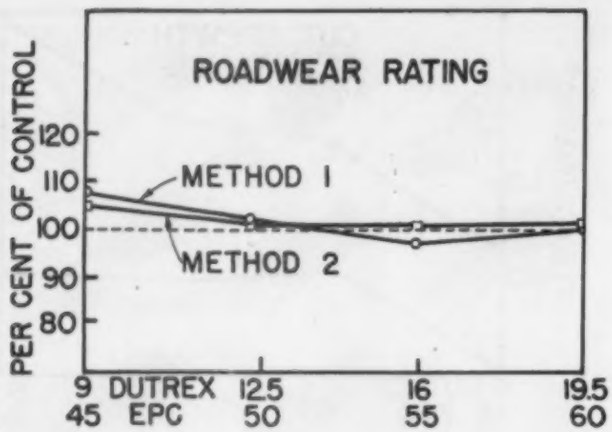

FIG. 5—Road wear ratings of GR-S passenger tire treads with increasing proportions of softener and EPC black.

ing increments of 5 parts of softener to 8 parts of black. The recipes for this series are shown in Table II. The physical properties of the laboratory compounds (cured 60 minutes at 145°C.) are shown in Figure 7. The relationships obtained here are similar to those observed with the EPC black series, i.e., with properly adjusted proportions most properties could be held at very satisfactory levels up to quite high loadings, but there was a slight decrease in resilience and a slight increase in hysteresis. The changes in the latter properties are sufficiently small that they could probably be eliminated by a slight increase in acceleration with increasing total loading, although this might, of course, affect some of the other properties.

In this series there appeared to be a slight loss of

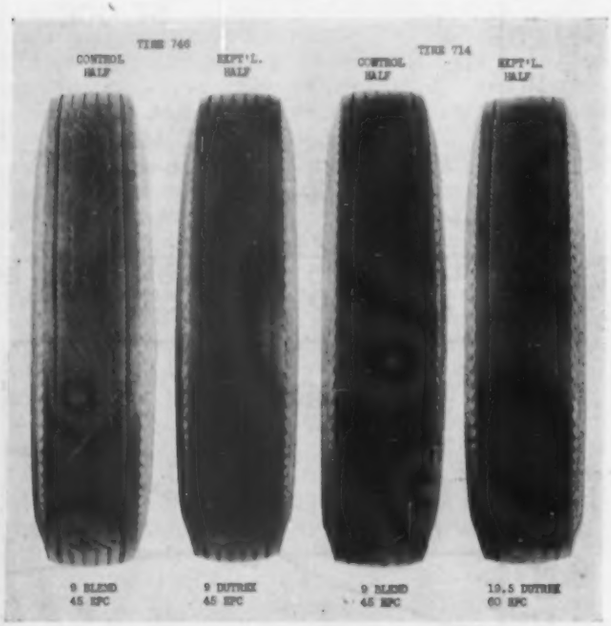

FIG. 6—Typical test tires, comparing highly extended GR-S tread with conventional compositions (6.00-16 tires, half-and-half treads, tested at Brooklyn, N. Y., 22,193 miles).

TABLE II—RECIPES FOR TRUCK TREADS

Base Recipe	
GR-S	100.00
Zinc Oxide	3.00
Age Resistor	0.80
Sulfur	1.70
N-Cyclohexyl-benzo-thiazole-sulfenamide	0.80

Softener and Carbon

Dutrex 6	0	5	10	15	20
HMF Black	44	52	60	68	76

Ratio, added carbon/added softener = 1.60

both tensile and abrasion resistance as the loading was increased, suggesting that it might not be possible to carry the extending action quite as far with HMF black as with EPC black.

For road tests, only two compositions were chosen from this series, the base stock with 5 parts softener and 52 parts of black and the next compound in the series, containing 10 parts of softener and 60 of black. Laboratory test data on the factory stocks and the road test results with these two compositions were reported in connection with the truck tire test series described in the preceding section. These data indicated that the two stocks had very similar properties in nearly all respects, both before and after aging.

The road test results on these two truck treads are compared in Table III. The figures given here represent the rating of each stock against the control half of the two-piece tread (5 parts mineral rubber, 52 parts HMF), which was used as the control throughout the entire truck tire test group. Again the values obtained by two different methods of rating tread wear are shown.

While in this case the two methods of rating gave somewhat different values, they both indicate that the extended compound containing 10 parts softener and 60 parts HMF black was equal or superior to the control and nearly equivalent to the stock with 5 parts unsaturated petroleum softener and 60 of black.

Figure 8 shows photographs of two typical tires from this group. These tires were tested on the same truck operating in the Sacramento valley of California and were run to the same mileage (13,720). The course was 100% paved and air temperatures were relatively high. It is evident that in this particular set the tread containing 60 parts HMF black and 10 of unsaturated petroleum softener gave about the same wear as the control, without appreciable cracking or chipping, whereas the tread containing 5 parts of unsaturated petroleum softener and 52 of HMF black outwore the control by a small margin.

Since the question of tread cracking and chipping

TABLE III—ROAD WEAR RATINGS OF TRUCK TIRES

Composition	Road Wear Rating, % of Control: From Final Tread Depths	From C vs. E Plots
Control (5 M.R., 52 HMF)	100	100.0
5 Dutrex, 52 HMF	104	101.4
10 Dutrex, 60 HMF	105	100.4

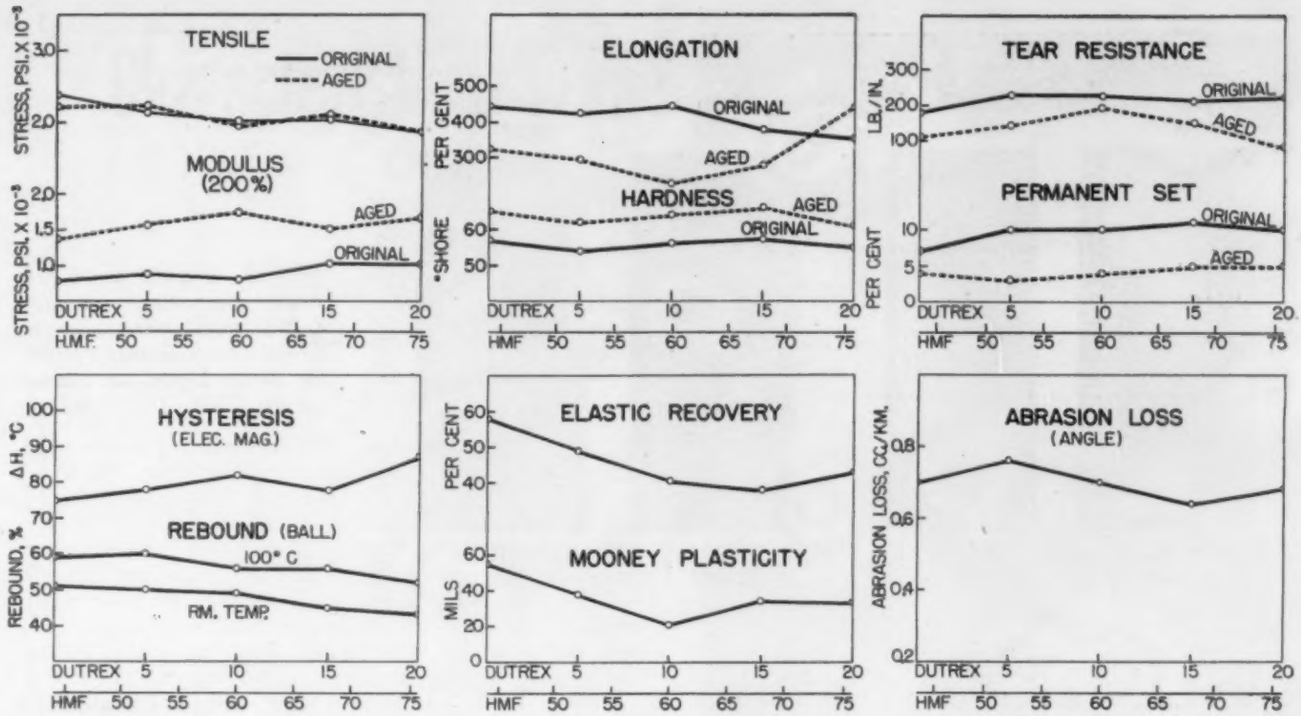

FIG. 7—Effect of increasing proportions of softener and HMF black on properties of GR-S tread stock (laboratory-mixed batches).

is of particular interest in truck treads, a close-up of another of the "extended" tires that was run under conditions somewhat more conducive to cutting and chipping is shown in Figure 9. This tire is one of a set that was tested on a truck operating in the vicinity of Utica, N. Y., over a course that included a certain percentage of gravel; it was photographed at 21,480 miles. The experimental half of the tread, containing 10 parts of unsaturated petroleum softener and 60 of carbon, shows no more damage from cut-growth or chipping than does the control half, which contained 5 parts of mineral rubber and 52 of black.

The over-all results of the combined laboratory and road tests of these two series of GR-S compounds, one group of which covered a fairly extensive range of compositions, provide considerable evidence that by the use of a suitable extender-type plasticizer together with added carbon black in carefully balanced proportions, GR-S tread stocks can be extended to a greater degree than has been commonly considered possible without appreciable sacrifice of road wear. Since this type of compounding offers advantages with respect to both economics and processing, it should be of practical interest in tire and camelback manufacture.

Test Methods

The test methods used in the work described in both this and the preceding paper are summarized briefly below:

Plasticity: Mooney plasticity at 100°C., determined with the standard large (1½") rotor, using a warm-up time of 1½ minutes and reading after one minute running.

Elastic Recovery: Determined by sheeting the compounded stock through the mill at a fixed setting and measuring the area of the sheet after resting overnight. The outline of the sheet is traced on paper and the area measured with a planimeter. From the mill-roll setting and the weight and density of the stock, the theoretical area for zero recovery is calculated and the per cent elastic recovery is then given by the expression:

$$\frac{\text{Theoretical Area} - \text{Actual Area}}{\text{Theoretical Area}}$$

Tensile, Elongation, and Modulus: ASTM Method D412-41 (Die C).

Permanent Set: Set at break, determined by measuring broken tensile test pieces.

Tear Strength: ASTM Method D624-41T (Die B).

Hardness: Shore "A" Durometer.

Rebound—Pendulum: Rebound in per cent of angular fall of pendulum bob dropped from 15° angle at room temperature. Impact is repeated until rebound reaches constant value. Average of two tests reported.

Rebound—Falling Ball: Rebound, in per cent of fall, determined with a falling-ball tester at room temperature and at 100° C. (212° F).

Hysteresis—St. Joe: Cylindrical test pieces, 1.5 in. in diameter and 1.5 in. high, cured 90 min. at 142° C. (287° F.), are flexed under following conditions: vertical load, 475 lb.; horizontal deflection, 0.08 in.; speed, 875 rpm. Temperature rise after 30 minutes is determined with a thermocouple inserted in the center of the specimen before testing. Average of two tests reported.

Hysteresis — Electromagnetic Tester: Temperature rise at equilibrium in an electromagnetic flexometer patterned after that described by Gehman et al *(6)*. Temperature is measured at the interface of two cylin-

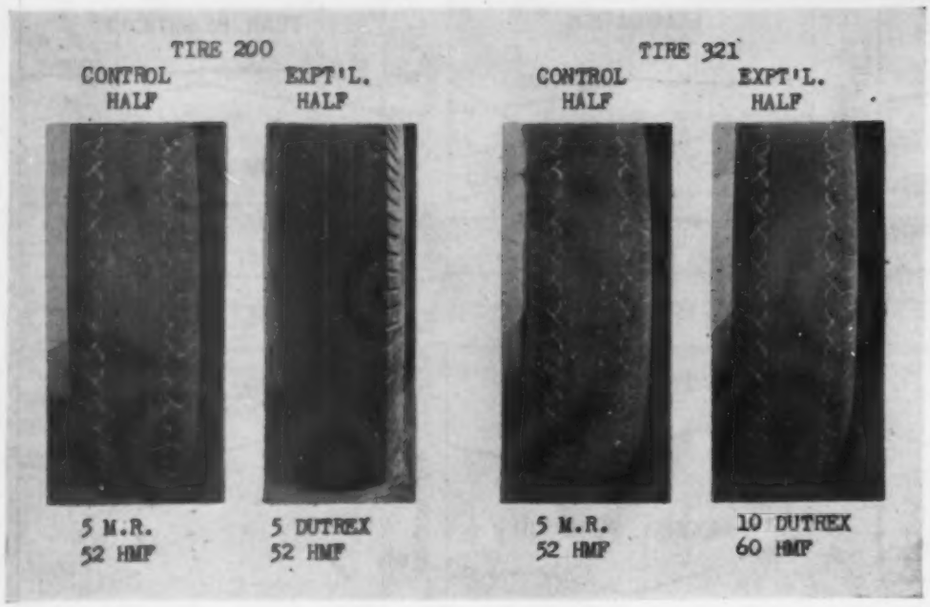

FIG. 8—Typical truck test tires, comparing extended GR-S tread with conventional compositions (10.00-20 tires, tested at Sacramento, Calif., 13,720 miles).

drical test pieces, ⅞-in. in diameter and ½-in. high, subjected to a 60-cycle stroke 1-mm. in amplitude. Average of two tests reported.

Cut-Growth Resistance (Hot): Number of flexes required to cause a 1-cm. increase in length of a nick in a grooved de Mattia flex piece. The samples are maintained at 100°C. (212°F.) and are flexed at a rate of 120 cycles per min. through an angle of 83° to open the cut and through a 20° angle in the opposite direction to compress the cut. Average of two tests reported.

Abrasion—New Jersey Zinc Abrader: Test specimens 5 in. x 2 in. x 3/16 in. are run for 1000 revolutions at 33 rpm. Abrasion loss in cc. is calculated from the weight loss of the sample.

Abrasion—Angle Abrader: Abrasion loss, in cc. per kilometer, on the Akron Angle Abrasion machine, using an angle of 15° and a Norton stone No. 19846-KD. The original machine was modified by the installation of a new gear drive and the provision of an air jet to keep the stone clean.

Aging—24 Hours at 100° C.: ASTM Method D573-42.

Aging—7 Days at 80° C.: ASTM Method D573-42, except that a single-pass oven is used which moves preheated air at 80° C. over the samples at a rate of approximately 20 linear feet per minute.

ACKNOWLEDGMENT

The number of participants in the testing program described in this and the preceding paper was quite large, but it is desired particularly to acknowledge the contributions of F. C. Theiss, C. B. Orr and others of the Laboratory and Production Development Departments of the General Tire and Rubber Company, who constructed the experimental tires; A. J. Simoncic and R. L. Clough of the Shell Oil Company, Incorporated, who set up the road tests; the personnel of the Operations Department of the Shell Oil Company, who conducted the road tests; and the many members of the laboratory staffs of the General Tire and Shell Development Companies who contributed to the laboratory evaluations. Thanks are expressed to H. B. Pushee, T. W. Evans, and K. E. Marple for guidance in planning and executing the program.

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NOTE: This paper was presented before the Division of Rubber Chemistry of the American Chemical Society at the meeting held in Cleveland, Ohio, May 26-28, 1947.

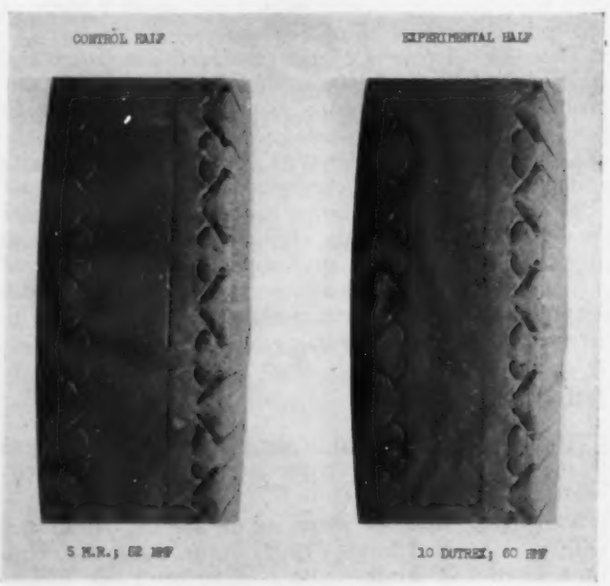


FIG. 9—Truck test tire, comparing extended GR-S tread with conventional composition (10.00-20 tire, tested at Utica, N. Y., 21,840 miles).

Characteristics, Properties and Applications of Geon Polyblend

By J. E. PITTENGER and G. F. COHAN

Technical Service Engineers, B. F. Goodrich Chemical Co., Cleveland, Ohio

THE physical blending of synthetic organic materials is a technique that promises the creation of many new products having not only improved physical properties but also properties never before attainable in the original materials. Many advances and improvements were made by the blending process during the last war. One only has to look at the synthetic rubber and the vast plastics industries to see the results. This knowledge, carried into peace time with many added months of development work, has resulted in a new B. F. Goodrich Chemical Company product called Geon Polyblend.

This new material combines the oil, chemical and age resistant properties of Geon polyvinyl chloride resin with the solvent resistance and flexibility of Hycar nitrile rubber. This versatility makes the new material of interest to both the rubber and plastics formulator for it can be handled on either plastics equipment or rubber machinery. It can be compounded with color pigments, fillers, stabilizers and rubber antioxidants to give a long-life, thermoplastic material. The unsaturated nature of the nitrile polymer constituent also permits vulcanization.

Blending polyvinyl chloride and acrylonitrile polymers contributes two outstanding advantages useful to the plastics and rubber industries. The use of polyblend makes possible the realization of many of the good properties of vinyl plastics without the troublesome factor of plasticizer migration. Of equal importance is the fact that polyblend is generally more resistant to aging than a straight nitrile rubber alone.

The combination of these and other outstanding properties has been captured by blending the two polymers in a colloidal state, thereby eliminating the need for any liquid plasticizer. The result is a new basic raw material ready for compounding. Heretofore such blends have been possible only by involved mill-mixing procedures.

Geon polyblend, shown on the right, has formed a smooth sheet after only one "pass" through a laboratory mill, while the natural and synthetic rubber pieces shown on the left are not suitable for further processing after one pass.

TABLE I—PHYSICAL PROPERTIES OF A TYPICAL GEON POLYBLEND (55% POLYVINYL CHLORIDE—45% HYCAR)

Tensile (psi)	1850
Elongation (%)	430
100% Modulus (psi)	1100
Hardness (Shore Durometer "A")	93
Specific Gravity	1.18
Crescent Tear (lbs/inch) (ASTM D624-44)	320
Rectilinear Tear (lbs/inch)	328
Low Temperature Brittleness (ASTM D736-43T)	—60° F.
Flexibility	Superior to rubber and Hycar but not as good as liquid plasticized polyvinyl chloride
DC Volume Resistivity (ohm-cm)	2.6×10^9
Dielectric Strength (volts/mil) 1/32" wall	960

Formulation of the Polyblend

Polyblend is furnished in the form of light yellow sheets about 3/8" in thickness. Because of its dual nature it can be compounded in any one of three major categories. It can be used as a thermoplastic similar to a vinyl, it can be formulated so as to respond to vulcanization, and last, but not least, it can be used to modify either a conventional polyvinyl chloride type plastic or a nitrile rubber compound. Whether used as a plastic or a rubber, all of the compounding can usually be carried out on a cold mill. When used as a modifier it must be mixed under the conditions that govern the proper handling of the material to which it is added.

In compounding polyblend to be used as a thermoplastic material, the nitrile rubber constituent can be regarded as a polymeric plasticizer. Table I shows the properties obtained by sheeting out the uncompounded stock and molding it for five minutes at 345°F. The tensile strength of the thermoplastic molded sheet is

not equivalent to the usual polyvinyl chloride plastic but is adequate for a great many applications. The hardness can be reduced if desired by using a conventional plasticizer since polyblend is readily compatible with all the plasticizers useful in manufacture of vinyl plastics. For example, 10 parts of dioctyl phthalate added to 100 of polyblend will reduce the hardness from 93 to 85. Concentrations of plasticizer of this amount do not seriously impair the non-migratory properties of polyblend compounds.

For stocks which are to be milled, calendered, or extruded, a small amount of lubricant is advantageous to improve processing. Such materials as lead stearate, stearic acid, paraffin, and Acrawax C have been found satisfactory. Lubricants keep the stock from sticking to hot mill or calender rolls and aid in extrusion. The choice of lubricant will depend on the application. For example, lead stearate is sometimes preferred because it also has a stabilizing action. However, it cannot be used where toxicity is a factor.

In heat or light resistant applications, the resin portion of the blend is subject to thermal breakdown, the same as conventional vinyl stocks. Excessively high temperatures will accelerate the oxidation of the rubber portion of the polyblend, as in straight Hycar or other rubber polymers. Thus, the normal heat stabilizers for vinyls, such as lead stearate, basic lead carbonate, SN and V-1-N, should be used where high temperatures are encountered in processing or in the service conditions peculiar to the finished article. For normal processing operations, such as calendering or molding, the material is sufficiently stabilized during manufacture. When the resin portion of the polyblend has been stabilized, the heat resistance of the compound is similar to that of a vinyl plasticized with tricresyl phosphate.

For maximum heat stability, the rubber portion should be protected with an antioxidant such as Agerite Stalite. This is shown in Table II where tensile, elongation, modulus and Durometer hardness data on stocks aged in air at 212°F. and 250°F. are presented. The percent loss in weight after aging at high temperatures (212°F.) is also shown. It will be noted that results on polyvinyl chloride formulations plasticized with dioctyl phthalate and tricresyl phosphate to a similar hardness are listed for comparison. The low weight loss of the polyblend compared to the tricresyl phosphate stock shows the non-volatile character of the Hycar as a plasticizer.

The figures from the 250°F. test demonstrate the value of using both vinyl stabilizers and rubber antioxidants for high temperature applications. After five days at 250°F., the polyblend compound, without additional antioxidant, was no better than the liquid plasticized stocks. Polyblend with 1% antioxidant (Agerite Stalite), however, retained its original properties and was little affected by the high temperatures. In general, most antioxidants promote discoloration of stocks exposed to light for prolonged periods.

The same approach is used in compounding polyblend for sunlight resistance. Stabilizers, such as Vanstay and V-1-N, are used for the vinyl portion in conjunction with special pigments for the rubber portion. Some pigments found to be effective are: carbon black, iron oxide, lead titanate (white), cadmium lithopone (yellow), basic lead chromate (orange), cadmium selenide (red), phthalocyanine blue and aluminum powder. Iron oxide should be used in amounts of at least 3 parts per 100 parts of polyblend. Most of these pigments are somewhat opaque to ultra-violet light and retard surface cracking. In general, polyblend compounds are more resistant to light than non-black nitrile rubber stocks, but are considerably less stable to light than liquid plasticized vinyl resins. Light energized oxidation of the unsaturated rubber portion of the polyblend is the main cause for this fact.

Polyblend is well suited to press-polishing operations. A small amount of lubricant and color will usually suffice for compounding. A typical formulation follows:

Polyblend	100.0
Color Black *	1.5
Acrawax C	0.5–1.0
Lead Stearate	0.2–0.3

* 25% Carbon black-75% dioctyl phthalate masterbatch. The addition of about 5 parts of dioctyl phthalate per 100 of polyblend will impart better "drape" characteristics to the sheet if desired.

Phenol formaldehyde resins may be added to polyblend in varying portions to form products ranging from flexible adhesives to tough, rigid materials of high impact strength. The following formulation was mixed on a cold mill and molded into tool handles and hammer heads:

Polyblend	100.0
Durez 12687	50.0
Clay	75.0
Calcium Stearate	2.0
Stearic Acid	2.0
Color	0.5

TABLE II—CIRCULATING AIR OVEN AGING TESTS

Compound				
Geon Polyblend 500 × 32[9]	100	100	....	....
Basic Lead Carbonate	10	10	....	....
Agerite stalite	....	1.0	....	....
Polyvinyl Chloride (Geon 101)	....	....	100	100
Dioctyl Phthalate	....	....	40	....
Tri Cresyl Phosphate	....	....	....	50
Basic Lead Carbonate	....	....	10	10
% Weight Loss at 212° F. After:				
5 days	....	0.56	.96	4.44	1.10
7 days	0.50	.89	9.41	3.12
14 days	0.24	.93	11.5	3.37
Original				
Tensile, psi	....	1900	1840	3200	3275
Elongation, %	....	470	485	305	295
100% Modulus, psi	....	1425	1410	2160	2260
Durometer Hardness, Shore "C"	70	65	72	70
After 5 Days @ 212° F.:				
Tensile, psi	....	1930	1800	3100	3120
Elongation, %	....	435	470	220	255
100% Modulus, psi	....	1375	1300	2840	2425
Durometer Hardness, Shore "C"	67	66	81	76
After 7 Days @ 212° F.:				
Tensile, psi	....	2100	1920	3050	3200
Elongation, %	....	435	460	225	280
100% Modulus, psi	....	1400	1325	3025	2500
Durometer Hardness, Shore "C"	68	70	91	86
After 14 Days @ 212° F.:				
Tensile, psi	....	2200	1950	3980	3200
Elongation, %	....	440	470	080	300
100% Modulus, psi	....	1350	1225	....	2780
Durometer Hardness, Shore "C"	68	67	85	78
After 5 Days @ 250° F.:				
Tensile, psi	....	2000	2075	5600	2800
Elongation, %	....	070	410	010	040
100% Modulus, psi	....	....	1300	....	....
Durometer Hardness, Shore "C"	76	70	96	90

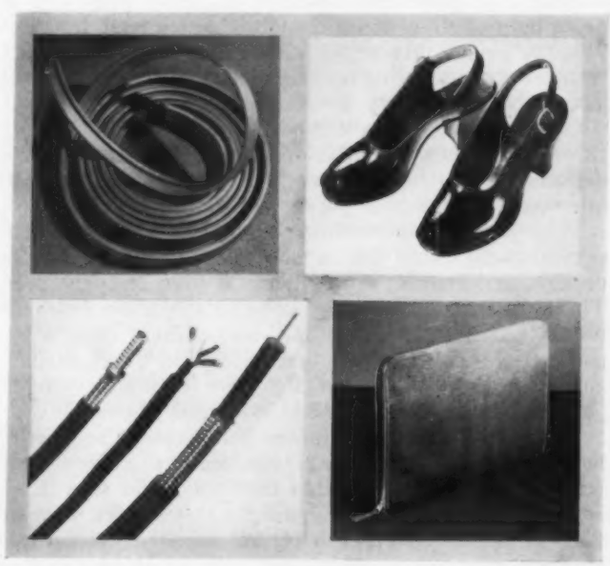
Polyblends can be dissolved in methyl ethyl ketone to form solutions containing 25 to 30% solids. Compounds are mixed in the usual manner on a cold mill and dissolved by simple stirring at room temperature.

Since polyblend contains unsaturated nitrile rubber, it can be vulcanized like other rubber polymers. Table III contains a comparison of the physical properties of vulcanized and unvulcanized polyblend. Mercaptobenzothiazole and benzothiazyl disulfide have been found to be satisfactory accelerators of vulcanization; however, accelerators, such as tetramethylthiuram disulfide, are breakdown agents for vinyl resin and should be avoided.

Compounds containing zinc are usually breakdown catalysts for polyvinyl chloride; however, zinc oxide may be used successfully for activating acceleration if the polyvinyl chloride is well stabilized and the zinc oxide is used in a concentration of at least 5 parts per 100 parts of polyblend. Even with these precautions, extreme temperatures experienced in extrusion and injection molding are to be avoided. It is important to note that zinc oxide is also an excellent pigment for improved sunlight resistance. Magnesium oxide is another activator which has been satisfactory for light colored stocks. For black stocks, litharge is the preferred activator. In general, vulcanization increases the tensile strength, modulus, hardness, abrasion and solvent resistance.

Processing the Polyblend

This new method of blending vinyl resins and nitrile type rubbers is superior to the earlier mill mixing techniques which required three separate processing operations, namely, (1) "Breakdown" of the rubber on a cold mill, (2) Plasticizing the resin on a hot mill, (3) Blending the rubber and plasticized resin.



UPPER LEFT: Shoe welt made from Geon polyblend. UPPER RIGHT: Polyblend forms the uppers on this pair of patent polished ladies shoes. LOWER LEFT: Three cables jacketed with polyblend, an aircraft engine primary lead, a shielded x-ray cable, and a radar cable, respectively. LOWER RIGHT: This embossed brief case has been calendered from polyblend.

TABLE III—COMPARISON OF THE PHYSICAL PROPERTIES OF VULCANIZED AND UNVULCANIZED POLYBLEND

	Unvulcanized	*Vulcanized*
Polyblend	100	100
Sulfur	...	1.5
Benzothiazyl disulfide	...	1.5
Selenium diethyl dithiocarbamate	...	0.5
Litharge	...	5.0
Molded	5 min. at 345° F.	30 min. at 310° F.
Tensile (psi)	1850	3150
Elongation (%)	430	325
100% Modulus (psi)	1100	1775
Hardness (Shore Durometer "C")	70	73
Compression Set (ASTM D-395 40T Method B)	75%	52%
Abrasion Resistance (ASTM Standard B)	55	241

The use of polyblend eliminates these operations because the vinyl resin and nitrile rubber are thoroughly blended in the manufacturing process. Plasticizing on a hot mill is no longer necessary because an intimacy of dispersion is achieved such as could never before be obtained in working with the dry raw materials. Even improved mill mixing techniques, where vinyl resin and rubber have been mixed without benefit of liquid plasticizer, do not produce products comparable to those prepared by the polyblend method.

Polyblend can be placed on a cold mill where a smooth band forms immediately. No "breakdown" period is required as is the case with rubber alone. Polyblend acts like rubber during the mixing operation in that all compounding ingredients may be added on a cold mill. When intended for use as a thermoplastic, polyblend must be heat treated at some point in the processing operations. At temperatures between 300° and 325°F. the colloidal blend becomes a homogeneous plastic material and retains this identity from the moment when "fluxing" becomes complete. This thermal treatment converts the material from a soft, somewhat tacky and relatively weak rubber-like nature, to a firm plastic with good physical properties. Polyblend has a rather remarkable property in that it can be calendered at the moderate temperatures used for rubber products after an initial heat treatment.

Like straight vinyl materials, polyblend can be processed at high temperatures to produce finished articles requiring no further heat treatment. It is recommended that a small amount of lubricant, such as lead stearate, stearic acid or paraffin, be added to polyblend to prevent the stock from sticking to the hot mill rolls. For ease of processing, the lubricant should be dispersed in the polyblend on a cold mill before the stock is placed on the hot mill.

Figure 1 demonstrates the heat necessary for adequate fluxing of the resin and rubber. In this experiment, polyblend was milled cold and molded at various temperatures. A similar experiment was carried out in which the polyblend was first milled at 300°F. before the tensile sheets were molded. A graph of these results is plotted in Figure 2. These two graphs reveal that heat is necessary for good physical properties, but it makes little difference whether heat is applied during a final operation, such as molding, or during a phase of processing, such as calendering or extrusion.

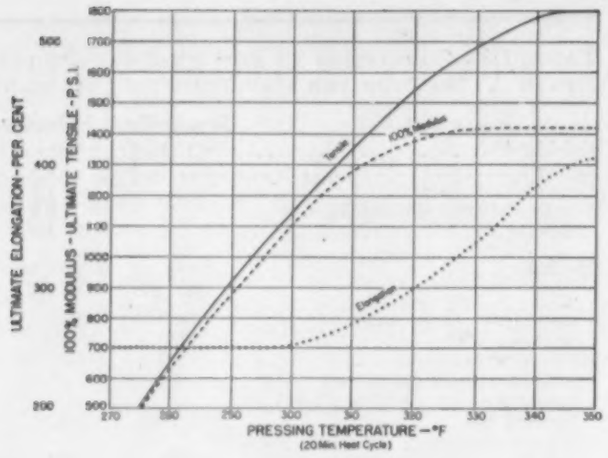


FIG. 1—Stress-strain properties vs. pressing temperature (Geon Polyblend 500x329 sheeted out on cold mill).

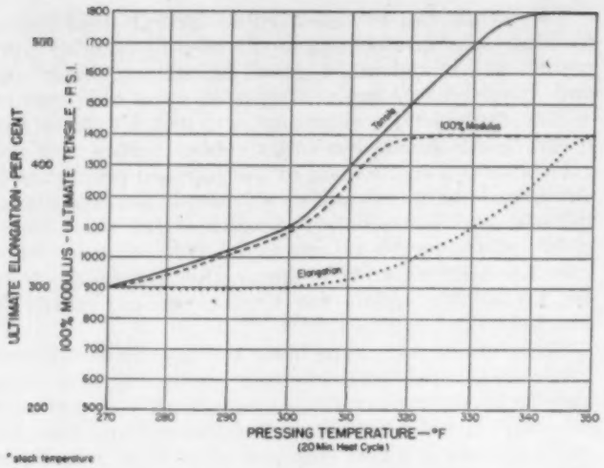


FIG. 2—Stress-strain properties vs. pressing temperature (Geon Polyblend 500x329 milled at 300°F. for 15 minutes prior to pressing).

Figure 3 shows the heat necessary to obtain good calendered products. Here a polyblend stock containing a small amount of lubricant was calendered at various temperatures. The sheets (.015") were taken off the calender, cooled and tested for ultimate tensile strength on a Scott I.P.-4 machine. The results show that temperatures above 300°F. at some point during processing operations are necessary for good physical properties.

Some Suggested Applications

The non-migrating, non-extractable, non-volatile nitrile rubber plasticizer used in Geon polyblend suggests wide applications in those industries that have experienced difficulty with the conventional plasticized vinyls.

In the electrical industry polyblend is adaptable to both jacket and low voltage primary insulation applications. As jacket insulation, there will be no plasticizer migration to destroy the electrical properties of the primary insulation, a fact that has limited the use of straight vinyls. When used as low voltage insulation for appliance cords, polyblend again insures no ill effects from plasticizer migration attacking varnished surfaces. This one characteristic alone opens up an entire field of uses such as unsupported and supported sheeting for ladies' handbags and upholstery materials.

The shoe industry should be particularly interested in polyblend because now a material is available that is not affected by bonding cements. Two such uses are shoe uppers and shoe welt. Polyblend also is equal to the vinyls in embossing and press-polishing qualities and actually gives a truer tone color than most vinyls.

Bookbindings made from a thermoplastic are now possible with polyblends. This industry must employ a material that will have good adhesion and not attack varnished surfaces or books bound with pyroxylin coatings. A polyblend solution is easily prepared at room temperature, using standard equipment. In addition, polyblend gives unlimited color range, ease of embossing, good aging and flexibility and the vinyl inks have been found very satisfactory for polyblend.

Good adhesive qualities are important in coating fabrics. The use of polyblend base coatings improves the adhesion of liquid plasticized vinyls to fabrics and other surfaces such as paper, wood, and metal.

With proper compounding, polyblend stocks are superior to tricresyl phosphate plasticized vinyls for dimensional stability after aging at high temperatures. Thermoplastic tubing and hose can therefore be made which retain their shape and, in addition, do not become stiff because of gradual extraction of plasticizer. Such tubing can be used for transferring beverages, gasoline, oils, solvents, and industrial chemicals.

Where high strength, better compression set, better heat resistance, and greater resistance to solvents are required, it is recommended that polyblend be vulcanized. Printing roll covers, gaskets, valve disks, football and basketball covers are typical uses for vulcanized stocks.

There are many more applications that can be considered suitable for polyblend material. The information contained in the sections on processing and formulation should indicate to the reader a host of uses other than those mentioned thus far. Embossed coverings for camera cases and binocular containers, hospital sheeting, industrial aprons and films for packaging are only a few uses now under test.

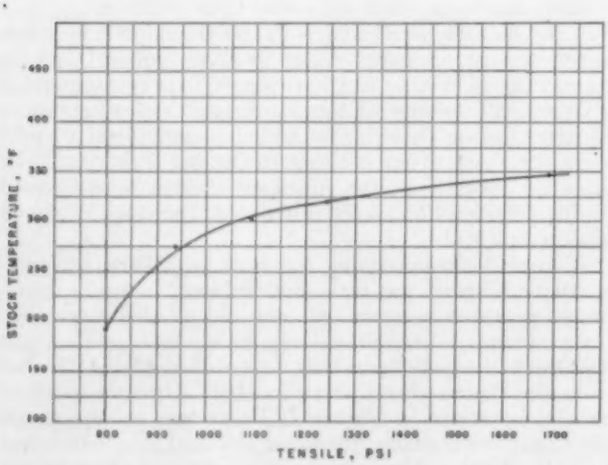


FIG. 3—Tensile strength of polyblend removed from calender at different temperatures.

Development and Standardization of Tests for Evaluating the Processibility of Rubber

By ROLLA H. TAYLOR[1], J. H. FIELDING[2], and M. MOONEY[3]

THIS paper reviews the important wartime developments in methods of standardization and tests, heretofore unpublished, relating to the evaluation of processing quality.

The term processing quality or processibility is used in the rubber industry to describe any one or all of the inherent characteristics of a rubber which may affect its behavior during the manufacturing process. The non-uniformity of various rubbers and the changes in behavior which occur with slight changes in the method of treatment make the determination of this quality one of the major problems in the manufacture of rubber goods. In an effort to measure this quality by laboratory methods, investigators had developed a number of different types of apparatus, usually with the idea of measuring some property which could be expressed as a function of the viscosity or the elastic recovery. In accordance with Scott Blair *(1)* and others, the term viscosity as used in this paper is not limited to Newtonian systems.

In 1942 the Technical Committee of the Rubber Reserve Co., primarily composed of technical representatives from the rubber industry, reviewed methods existing at that time and decided that some measure of the viscosity should be used for controlling the processing quality of GR-S and that the Mooney viscometer (then called the Mooney plastometer) should be the standard instrument for this purpose in Government Synthetic Rubber plants. When the production of GR-I began, it was adopted as the standard control instrument for this rubber also. The Williams plastometer had been used as the control instrument for neoprene production and consequently was used for GR-M. Since May 1, 1947, however, the Mooney viscometer has been specified for grading GR-M production.

Soon after the GR-S plants began to operate in 1943, it became apparent that considerable standardization was required before reproducible results could be obtained even with the same instrument and operator. As a consequence, in July, 1943, the National Bureau of Standards was assigned the tasks of (1) developing a standard procedure for determining Mooney viscosity, (2) improving the design, and (3) establishing suitable tolerances of dimensions for the different parts of the viscometer.

The development of a standard procedure and improvements in design of the Mooney viscometer have led to quite satisfactory reproducibility. Proper control of the viscosity has made it possible for the rubber industry to accept standard GR-S from any one of the Government Synthetic Rubber plants with the assurance that it will behave in accordance with past experience. It is not to be implied, however, that all GR-S having the same viscosity will have exactly the same processing quality, because, even with the rigid controls imposed during manufacture, differences in processing quality have been observed, particularly in production from different plants. Thus it has become necessary to look for methods of measuring other characteristics related to the processing quality or processibility. For this, attention has been directed to objective mill methods proposed by White, Ebers, and Schriver *(2)* and more fully developed by Government Evaluation Laboratories *(3)*, to laboratory extrusion and factory methods used by the Goodyear Tire and Rubber Co., and to additional tests which can be made on a modified Mooney viscometer such as rate of cure or "scorch" tests, elastic recovery tests, and complete viscosity-time curves.

Factory Processes and Their Relation to Processibility Measurements

In the factory processing of rubber there are two main objectives: first, to obtain a uniform mixture of the various ingredients entering into the compound, and second, to convert a given quantity of this mixture into the proper size and shape for further handling or for vulcanization.

As a general rule, the amount of mechanical work (plastication) required to accomplish the uniform mix is not sufficient to give the material the properties necessary to accomplish the forming operation. For this reason it is necessary to use additional work, and, depending upon individual choice, this additional work may be done in either a plasticator or a Banbury mixer, or it may be in the form of longer mixing time or additional mixing steps. Information obtained from a study of this additional mixing requirement can very well be used as a measure of factory processibility.

Of the various methods used to put a rubber compound into the proper size and shape for vulcanization, the operations of extruding and calendering are most widely used. In the extrusion operation, which is used for example to form a tire tread, the completely mixed compound is extruded through a die which is somewhat smaller in all dimensions than the required section. Immediately after extrusion the stock expands laterally. If the resulting size and shape are correct and stable, if the cohesion is such that the surfaces and

[1] National Bureau of Standards, Washington, D. C.
[2] Goodyear Tire & Rubber Co., Akron, Ohio.
[3] U. S. Rubber Co., General Laboratories, Passaic, N. J.

Note: This paper was presented at the "Symposium on Rubber Testing" held by A.S.T.M. Committee D-11 on Rubber and Rubber-Like Materials at Atlantic City, N. J., on June 19, 1947. It will be included in a special booklet containing all of the papers presented at the symposium to be issued later in the year by the American Society for Testing Materials.

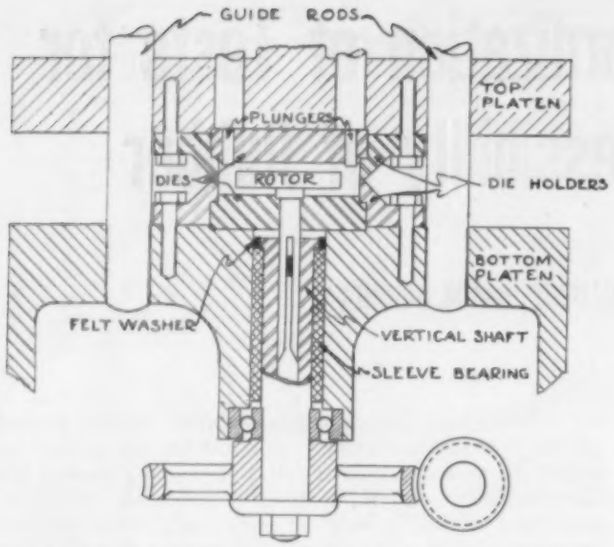


FIG. 1—Cross section of Mooney viscometer showing test chamber (rotor die relationship).

edges are sufficiently smooth and uniform to permit the subsequent manufacturing steps, and if the stock does not scorch, the operation can generally be considered satisfactory, otherwise not.

In the calendering operation, a completely mixed compound is passed between a pair of heavy rolls to form a sheet on one of them. It is then removed as a sheet to be used as such, or it is applied on this roll to some type of fabric which is later built into the product. This calendering operation has the same requirements as extruding. The material must be put in the desired shape and must remain in that shape. The smoothness of the surface required depends upon the product. Shrinkage is undesirable, and lack of cohesion may permit the formation of holes before the sheet is removed from the calender.

In most modern, efficient factories the total milling is held at whatever minimum will permit satisfactory handling in later operations. It is under these conditions of minimum milling that differences in the amount of factory processing required appears to be greatest, since in this case the processing requirements are most sensitive to the processing quality of the polymer. If considerable excess milling is used, polymer differences become less noticeable.

The general solution to most of the difficulties involved lies in the use of additional mechanical work. In some factories the variation in processing quality is corrected by using no additional plastication, one additional plasticating operation, or more, as the case requires. In other factories it is the practice to make a masterbatch containing the polymer, black, and possibly some other ingredients, and then to rework it a sufficient number of times to produce satisfactory performance in the extrusion or calendering operations.

Since the chief remedy for adjusting stocks which fail to form satisfactorily is to subject the stock to additional mechanical work, it would appear that some simple test could be made which would form a basis for predicting the amount of plastication required for a particular rubber. Unfortunately this is not the case, because additional mechanical work is required for different reasons with different polymers. For instance, the viscosity may be high enough to cause scorch, the elastic recovery may cause the shrinkage to be high, or the roughness may be too great. These properties are all interrelated in a given polymer, but this relation is different for different polymers. Hence it is obviously impossible to evaluate a polymer completely by measuring only one or two properties. This is emphasized by a recent review article *(4)* which has described the major processing defects of raw rubbers and the related rheological tests that have been developed. Measurable processing qualities are rate of extrusion, shrinkage after extruding or calendering, and surface roughness or rugosity *(5)*. Rheological tests include three types of "plastometers" or viscometers, the compression *(6, 7, 8)*, extrusion *(9, 10, 11)*, and shearing *(12, 13)* types. Elastic recovery also is measurable in each of these tests. Tack *(14)*, while measurable and of recognized importance, is usually merely estimated by crude hand tests.

The main problem in the control of processing quality, namely, how to predict processing behavior of a given raw stock from rheological tests on the stock, also was reviewed in this article. Some initial success in this problem was shown in a few examples, where some correlation was established between rheological tests and certain measured processing defects or properties.

It is, therefore, evident that a method must evaluate each of these parameters or characteristics before it can be depended upon for predicting the behavior of polymers for a given factory procedure.

Measurements of Viscosity with Mooney Viscometer

The essential features of the Mooney viscometer *(13)* are shown in Fig. 1. The specimen is formed by closure of the die cavity, thereby forcing the material to surround the rotor and completely fill the cavity. With the specimen held under pressure the rotor is driven at a constant speed of 2 rpm by a motor. The torque required to shear the rubber between the surfaces of the die cavity and the rotor is measured by the deflection of a calibrated spring. The reading of this deflection at any instant is taken as the Mooney viscosity and has been shown to be proportional to the mean viscosity, in fundamental units, of the material under test for the prevailing conditions *(13)*.

In order to ascribe significance to a single value of Mooney viscosity in evaluating a material one must specify the testing temperature, the time of reading, and the history of the material. In assigning a single value of viscosity to a rubber it is also customary to state the size of rotor used and to indicate the conditions in abbreviated form. A determination made with the large rotor, at 212°F., 4 minutes after starting the rotor, is written "ML 212°F. at 4 min.". If the small rotor were used it would be written "MS 212°F. at 4 min."

Standardization of Viscosity Determinations

Preliminary tests made with the Mooney viscometer in 1943 proved it to be far from satisfactory as manufactured at that time. Certain changes were obviously necessary and certain others appeared to be desirable. The problem was to get this instrument to function in a satisfactory manner in a reasonably short time. In order to facilitate this, it was decided that only those modifications would be permitted which could be

readily adapted to the viscometers already in use in each plant.

Ideas regarding the causes of error were gleaned from the rubber manufacturing industry, the synthetic rubber plants, and from private investigators. These ideas were carefully studied and tested and the necessary corrective measures taken. Through an intensive program of instrument development and of education in the technique of operation it has been possible to improve the results obtained, to such an extent that we may expect individual determinations made on the same machine by the same operator to have a maximum range of 1.0 unit.

Individual tests made in different laboratories with different machines and different operators may be expected to have a maximum range of 4.0 units or a standard deviation of approximately 0.7 unit. An individual laboratory can be expected to obtain results with a standard deviation of less than 0.5 unit. The mean values obtained from daily tests during one month on reference lots by 16 GR-S plants frequently have a spread of less than 1.0 unit.

For example in December, 1946, the average value obtained by all plants on X-289 GR-S was 49.3. The lowest mean value reported was 49.0 and the highest 49.8 with standard deviations for the individual plants ranging from 0.21 to 0.68. In contrast to this the mean values reported on X-55 GR-S in June, 1944 (the first month in which viscosity was determined on a reference lot), ranged from 46 to 61 with an average of 54. Each of the many improvements in design and operation has contributed to the improved results. The three factors mainly responsible were: (1) a change in method of reading, (2) limiting dimensions of the die cavity and the rotors within suitable tolerances, and (3) a more reliable procedure for adjusting the die closures.

It was customary prior to 1943 to take either one single reading at a specified time or to take readings each half minute. The error resulting from either of these methods is clearly evident from readings taken every 5 seconds and plotted as in Figs. 2 and 3.

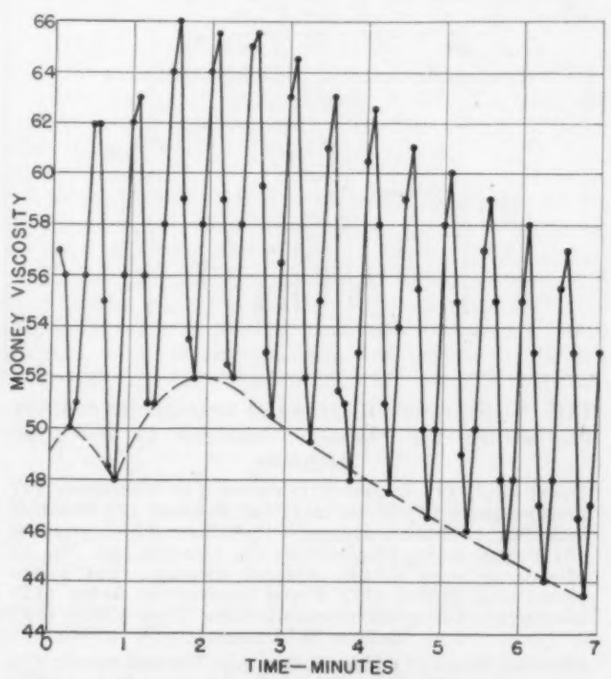


FIG. 2—Effect of large variable friction, due to eccentricity of the rotor stem, in causing fluctuations with a half-minute period.

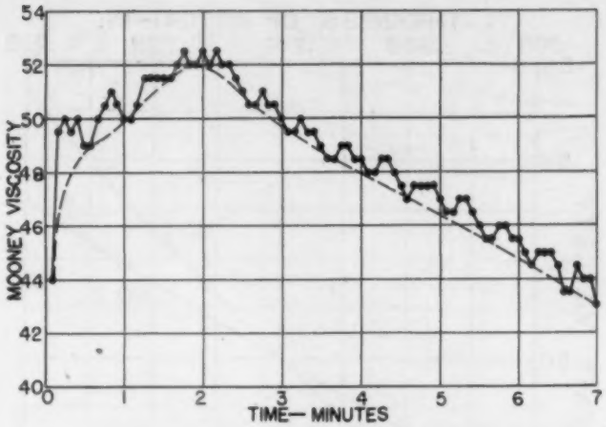


FIG. 3—Effect of small variable friction, due to eccentricity of the rotor stem, in causing fluctuations with a half-minute period.

The results shown represent the two extremes found from tests made with eight different rotors randomly selected from stock. Pronounced periodic fluctuations of two cycles per minute with amplitudes ranging from one to fifteen units were obtained with all of the rotors. Similar experiences were reported from the synthetic rubber plants. This condition accounted for most of the variation in viscosity values reported.

These fluctuations were caused by variable friction in the apparatus due to eccentricity of the rotor stem, with a period the same as that of the rotation. Since the fluctuations represented frictional effects superposed on the true value, it seemed logical to regard only the periodic minimum values as possibly significant. It was indeed found that when the viscosity values were determined from smooth curves drawn through the minimum points of the fluctuations they were in reasonably good agreement in spite of the wide differences in the amplitudes of the fluctuations. Furthermore it is evident from data such as those shown in Fig. 2, that the value of a reading taken at a specific time will depend on the phase of the fluctuation at the time of reading. The error in this case may therefore be anything from 0 to 15 units. Basing the viscosity value on the minimum points of the fluctuation was thus the first important step in the standardization procedure.

Little attention was paid to the dimensions of the dies and rotors in the early part of the program, in spite of the fact that the original equations of Mooney *(13)* indicated their importance. The variation in dimensions of the parts actually furnished was far beyond the tolerances required. Fig. 4 shows the theoretical effect of changes in rotor dimensions. The few experimental results obtained are in agreement with the theory. A change in the total depth of the die cavity has essentially an equal, but oppositely directed, effect to a change in the thickness of the rotor *(15)*. A rotor of reduced diameter is sometimes used for scorch tests and for testing rubbers having high viscosities.

The use of the small rotor has been virtually abandoned at the National Bureau of Standards and in the government synthetic rubber plants, however, because

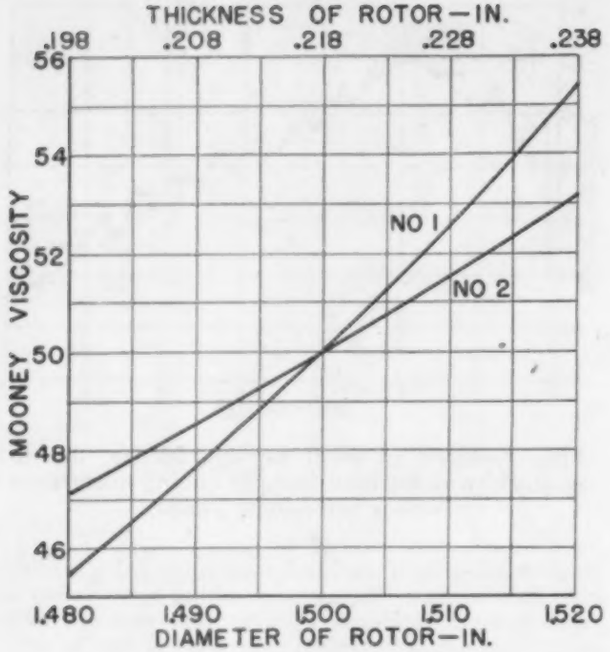


FIG. 4—Calculated effect of rotor dimensions on Mooney viscosity reading.
Curves: (1) Effect of variation in thickness, (2) Effect of variation in diameter.

it was found that (1) an exact correlation could not be drawn for 1.2 and 1.5-inch diameter rotors, and (2) the reproducibility of tests with the small rotor did not appear to be as good as those with the large rotor. The industry has, nevertheless, found it necessary to use the small rotor for testing rubber and rubber compounds which would have a value of more than 200 ML units.

After correcting these major sources of variation, the necessity of properly adjusting the die closures became evident. Several methods were tried before finding a suitable one involving the use of springs and feeler gages. The paper "Factors Affecting Results Obtained with the Mooney Viscometer" *(15)*, describes in detail the standard procedures and the condition of the machine which are necessary for reliable testing. In addition, the test specimen must be properly prepared and the test temperature properly controlled. The National Bureau of Standards has obtained satisfactory temperature control with both steam and electrical heating. Fig. 5 shows schematically the recommended controls for each method. Fig. 6 shows the effect of change in test temperature on the viscosity of GR-S, GR-I, and GR-M. Variation in the test temperature during scorch tests is much more critical, as will be shown later.

Variations which may occur as a result of differences in sample preparation are shown in Fig. 7. The necessity for standardization in the procedure of preparation of the specimen is obvious. The recommended procedure, used for curve 4, yields a highly reproducible value at 4 minutes and involves the use of only a single mill opening.

Other Developments in Viscosity Measurements

When satisfactory precision of testing was achieved, attention was directed toward improvements in design of the viscometer which would permit easier operation and to methods for determining other properties from which the processing quality of the polymer could be more accurately evaluated.

One of the first items to receive attention in this respect was the method of adjusting the die closure. Although the method of employing springs and feeler gages seemed to give satisfactory results, the adjustment was sufficiently critical to justify further consideration. As a consequence, a 6-inch diameter pressure cylinder (shown in Fig. 8) was adapted to open and close the machine. It was found that a pressure of approximately 25 psi on the cylinder (a force of approximately 700 pounds holding the dies closed) gave the best performance for all types of rubber. It was also found, however, that this force was insufficient to close the dies when a stock having a high viscosity was being tested. It was therefore necessary to use two pressures, one for closing the dies, and the other for holding them closed during the test.

The only requirement of the closing pressure seems to be that it must be sufficient to close the dies completely; otherwise low values will result. Rubbers having viscosities near 200 units using the large rotor at 212°F. require a closing pressure of approximately 110 psi. It has therefore been the practice to close the dies with approximately 100 psi for all rubbers, hold it for the first 50 seconds of the warm-up period and then reduce it to 25 psi before starting the motor.

In tests made on GR-S, GR-I, GR-M, and natural rubber with air pressure in the cylinder ranging from 10 to 40 psi, the maximum difference in viscosity was only 2 units and for most of the rubbers it was only 1 unit. The fact that this variation with pressure was so small was surprising in view of the critical effect

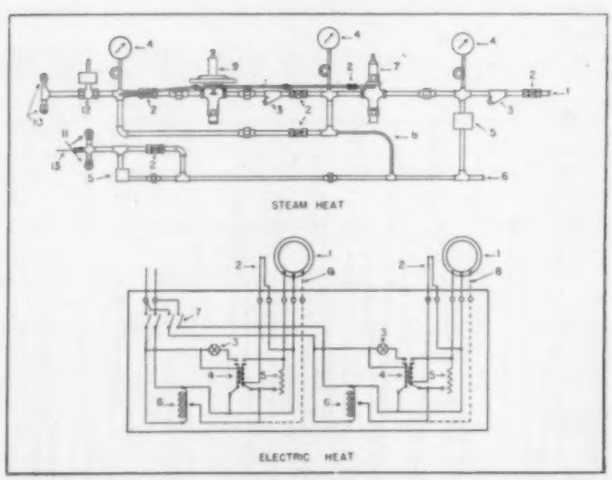


FIG. 5—Schematic diagrams of temperature controls for heating the Mooney viscometer by steam or electricity.

Steam Heat: (1) Intake; (2) Valves; (3) Y-Strainer; (4) Pressure gage; (5) Steam trap; (6) Exhaust; (7) One-half inch No. 11 Masoneilan valve 5-75-lb. reduced pressure; (8) Copper tubing bleeder line; (9) One-half inch No. 12 Masoneilan valve 0-15-lb. reduced pressure; (10) Platen connections, intake; (11) Platen connections, outlet; (12) Minneapolis-Honeywell pneumatic valve, Type V-053; (13) Bulb to M-H control.

Electrical Heat: (1) Heater ring; (2) Thermal switch; (3) Pilot light; (4) Relay, D.P.S.T. Struthers Dun 1BXX; (5) Slide wire resistance, 5 ohm, 5 amp.; (6) Variac, Type 200 CM 860 v-amp.; (7) Switches; (8) Dotted line, connection for two-unit heater ring.

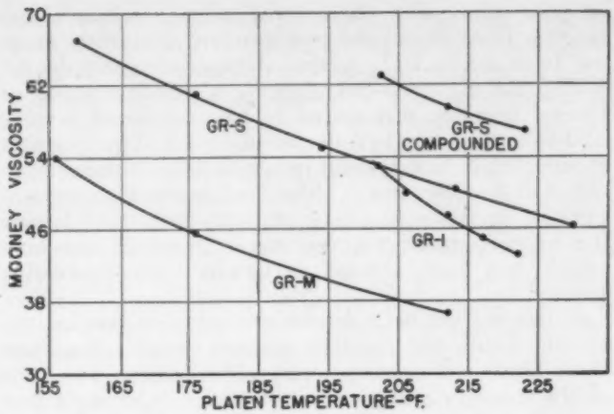


FIG. 6—Effect of temperature of test on the Mooney viscosity of three different synthetic rubbers.

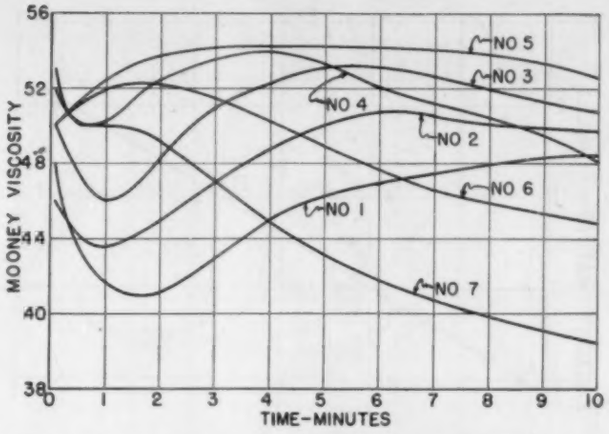


FIG. 7—Effect of method of sample preparation on the Mooney viscosity of GR-S.

Curves: (1) Sample tested as received; (2) Sample given 5 passes through a 6x12 laboratory mill at 120° F. with a mill opening of 0.096 inch; (3) Sample given 10 passes at 0.096 inch; (4) Sample given 10 passes at 0.055 inch, recommended procedure; (5) Sample given 1 pass at 0.005 inch plus 5 passes at 0.096 inch; (6) Sample given 5 passes at 0.005 inch plus 5 passes at 0.096 inch; (7) Sample milled for 5 minutes.

of adjustment of the die closure on the results obtained with the standard machine.

A pressure of 25 psi on rubbers ranging in viscosity, ML 212°F., from 16 to 120 gave results essentially the same as were obtained with the standard machine. Furthermore, the results obtained when the hydraulic cylinder was used were slightly more reproducible. The advantages and disadvantages of using the hydraulic cylinder are:

ADVANTAGES

1. Better reproducibility.
2. Necessity of careful adjustment of die closure is eliminated.
3. Closing and opening is by power.
4. Viscosity and recovery values are not greatly affected by changes in air pressure.
5. Safety hazard of dropping handles is eliminated.

DISADVANTAGES

1. High air pressure must be available.
2. An additional operation is necessary since a high pressure (approximately 100 psi.) must be used for closing and a low pressure (approximately 25 psi.) must be used during the actual test.

The improved performance makes a change to the air cylinder for closure and a standardization of air pressure at 25 psi. desirable.

Another development which should be a great aid in obtaining viscosity data and which may also give additional information is the use of a recorder. Several schemes were considered and tried before the Brown Electronic recorder with a Micro-Torque resistor attached to the dial gage for a pick-up was selected. Three different types of recorder arrangements are possible: (1) A single unit recorder may be used to record viscosity only; (2) A multiple unit recorder may be used to record as many as four viscosities simultaneously; (3) A multiple unit recorder may be used to make three viscosity records and one temperature record.

The arrangement which should be selected will depend upon the use that is to be made of the data. For information on scorchiness it seems that a temperature record is most essential and a multiple unit recorder may be desirable. For general testing, the single-unit continuous recorder may be most desirable because it enables the complete viscosity time curve to be taken.

From an analysis of the initial part of the curve it appears likely that the thixotropy of the rubber could be evaluated. There seems to be some theoretical basis for assuming that a measurement of thixotropy could be used to estimate the tackiness of rubbers *(4, 16)*.

The Micro-Torque resistor has a full 360° travel without any fixed stop. Consequently, when the reading rises above 100 units the recording element returns from 100 to 0, and again traverses the chart for readings between 100 and 200.

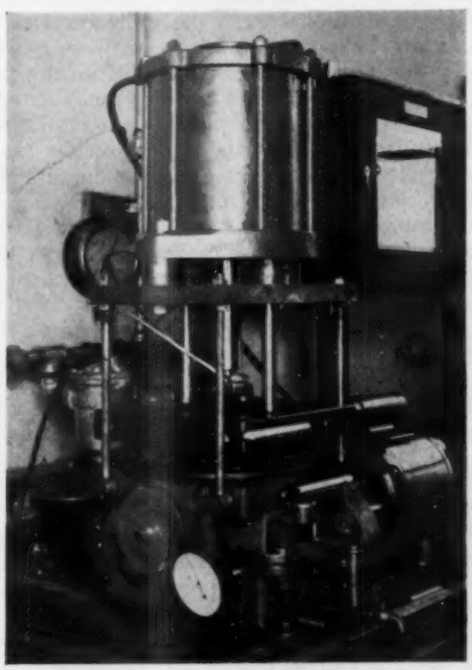


FIG. 8—Mooney viscometer equipped with hydraulic cylinder and recovery device.

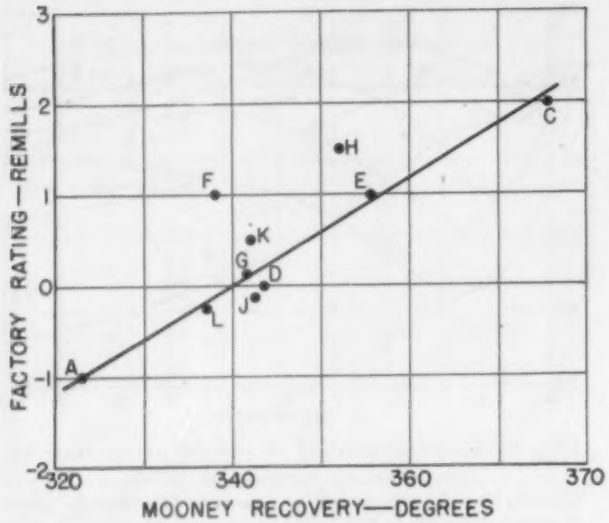


FIG. 9—Relation of Mooney recovery value to factory processibility rating.

Use of Mooney Viscometer for Measuring Other Properties

ELASTIC RECOVERY: The importance of elastic recovery as a factor in processibility has long been recognized *(4)*. Some measurements of this property have been made with each type of instrument used to measure viscosity. Most of these measurements, however, did not have satisfactory precision. A better method of measuring this property was desirable and consequently a recovery device was adapted to the viscometer shown in Fig. 8. This device was similar in operation to the one used by Mooney *(4)* but has greater magnification and is considerably more sensitive.

An indicator made to read in degrees of rotation is geared to the upper part of the vertical shaft with a ratio of 10 to 1 to the shaft. The indicator is driven by a light friction drive on the indicator shaft. It is automatically held at zero by a small stop which is manually thrown into position just before the recovery clutch is to be released. The bronze gear is mounted on a separate vertical shaft in the lower part of the housing. The two vertical shafts operate on the same center line, and connection is made by a dog clutch operated by a lever on the front of the machine. This scheme results in a freely turning upper shaft when the clutch is disengaged and permits recovery to occur without appreciable friction from the driving mechanism.

The recovery value obtained will depend on the temperature and the time of reading after disengaging the clutch. Present practice is to disengage the clutch ½-minute after the specified time for reading the viscosity. In this manner the clutch is released at 4.5 minutes for GR-S, 8.5 minutes for GR-I, and 3 minutes for GR-M. The recovery reading is taken 30 seconds later.

Fifty-seven determinations made over a 5-month period with this device on X-289 GR-S gave a mean recovery value of 338 with a standard deviation of 4.7. Further improvements incorporated in the present device have decreased the standard deviation to 3.4 for this polymer. It should be emphasized, however, that the standard deviation obtained is dependent upon the homogeneity of the polymer.

For example, tests made on a series of GR-S rubbers which had been qualitatively rated as having good or poor processing characteristics gave mean values ranging from 280 to 348 and standard deviations ranging from 2.5 to 16.7. A special experimental polymer, X-285 GR-S, cross-linked with a small amount of divinyl benzene, was found to have a recovery value of 144 with a standard deviation of 2.8. This polymer is reported to be markedly easier to process than standard GR-S polymers. Those polymers showing the greatest variation in elastic recovery and those having the highest elastic recovery were generally the ones which had been classed as having poor processing quality.

It has not yet been determined whether one can set specific limits and say that rubbers which fall outside those limits will cause processing difficulties. The value of the recovery measurement, however, is strongly supported by the correlation shown in Fig. 9 between the recovery value and the Goodyear Tire and Rubber Co. factory rating in remills *(17)* for ten different GR-S polymers. With the exception of samples F and H, reasonably good correlation exists. Further examination of the data revealed that all the samples had Mooney viscosities after compounding of 57.5 ±1 except samples F and H which had values of 64 and 61, respectively. It would seem, therefore, that in this particular case a reasonably good indication of the processibility is given by consideration of the recovery of the uncompounded polymer and its viscosity after compounding.

It is not intended that the graph shown shall be taken as conclusive evidence of correlation between single recovery values obtained on unmilled polymers and processibility for samples of the same viscosity after compounding, but merely that there is some general relationship between recovery and processibility. Whether the best measure of this relationship is the recovery value measured on the unmilled polymer, on the polymer after a specific amount of working, on the compounded stock, or the difference between two measurements made on portions of the polymer treated in different ways, has yet to be determined.

It is possible that the method used to evaluate polymers may have to be adjusted to the specific procedure used in a particular manufacturing process. This condition is due to the fact that the recovery value obtained is dependent upon the complete history of the polymer and that the rate of change in recovery value during breakdown sometimes varies considerably even for polymers of the same type. For instance, two samples of GR-S tested recently had recovery values of 315 and 317, respectively, after being prepared for viscosity tests in accordance with the current Specifications for Government Synthetic Rubbers *(18)*. The same samples after being milled for two minutes had recovery values of 260 and 304, respectively. From an analysis of the results obtained to date it appears that elastic recovery as measured with the modified Mooney viscometer might be used in three ways to aid in evaluating processibility: (1) A single value measured on the sample after some rigidly specified method of preparation; (2) The difference between two values obtained on samples given different amounts of breakdown; (3) the variation obtained from repeated tests made on the same sample or on identically prepared samples of the same material.

DETERMINATION OF CURE CHARACTERISTICS: The cure characteristics are important with respect to the processing quality only because incipient cure or scorch is apt to occur in factory procedures with stocks which

start to cure at too low a temperature or in too short a time. Differences in cure characteristics can easily be corrected by changes in type or concentration of accelerator. It is necessary, however, for the compounder to know the relative characteristics in order to do this. Some easily performed test for evaluating scorch time and rate of cure is therefore desirable. Weaver *(19)* has described scorch tests made with the Mooney viscometer at 250°F. in which he took the time required for the viscosity to reach 100 as the scorch time. Juve *(20)* has stated that the following method for determining the relative scorchiness and curing rates of GR-S yields results which correlate well with the curing rates selected from stress-strain data:

"The rubber is put in the Mooney viscometer, heated by steam to 300° F. As soon as the viscometer is closed the stopwatch is started. After one minute preliminary warm-up, the rotor is started and viscosity readings are made every one-half minute. The time necessary to reach the last minimum viscosity reading is taken as the scorch point. The test is continued until a viscosity reading 30 points higher than the scorch point is attained. The total elapsed time is recorded as cure point. The relative curing rate equals the scorch point plus six times the difference between the cure point and scorch point."

Figs. 10 and 11 are typical results from Juve's unpublished work showing the effect of change in temperature of test and accelerator concentration respectively. These tests were all made with the small rotor.

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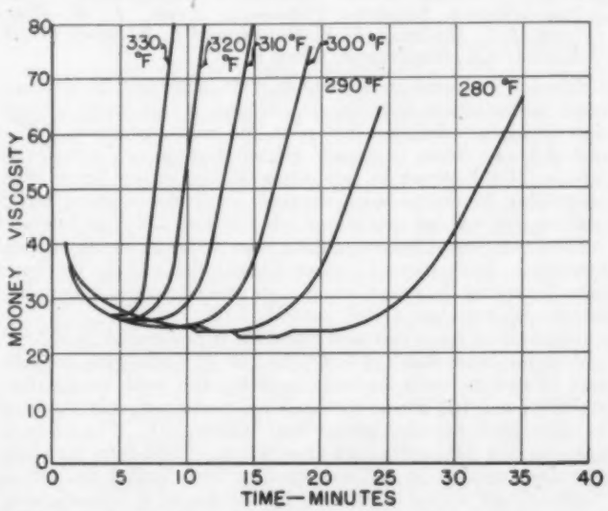

FIG. 10—Effect of temperature of test on cure characteristics of GR-S tread stock; Santocure accelerator.

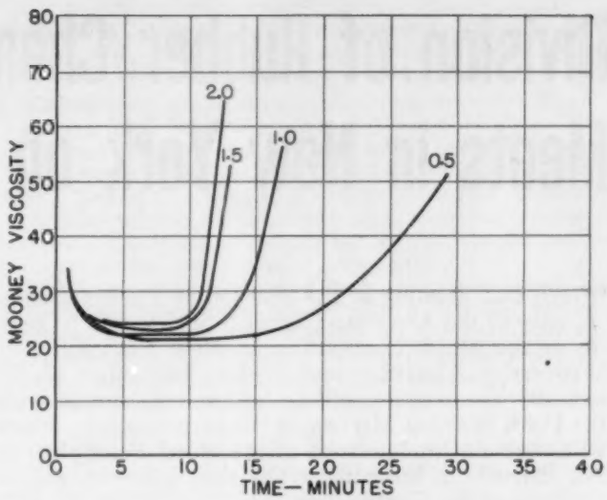

FIG. 11—Effect of accelerator concentration on cure characteristics of GR-S tread stock. (Numbers on curves are parts of Santocure per 100 parts of rubber.)

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(To Be Continued)

Division of Rubber Chemistry, A.C.S., Meets in New York on September 17-19

THE Fall Meeting of the Division of Rubber Chemistry of the American Chemical Society will be held at the Hotel Commodore in New York City on Wednesday, Thursday and Friday, September 17, 18 and 19. The meeting will be held in conjunction with the 112th National Meeting of the parent society, which will maintain headquarters at the Hotel Pennsylvania. All activities of the Rubber Division, however, will be centered at the Commodore.

The Division meeting will feature the presentation of 30 technical papers, a business meeting, and the regular banquet. In addition, a Suppliers Cooperative Cocktail Party will be held just prior to the banquet, both of these events being scheduled for Thursday evening, September 18. The business meeting will be held during the session on Wednesday afternoon.

Technical sessions will be held on Wednesday afternoon, Thursday morning and afternoon, and Friday morning. Following the procedure established at Cleveland last May, the papers have been grouped for presentation. Papers at the Wednesday afternoon session will cover various polymers, those on Thursday morning will be devoted to new methods of tests, compounding procedures and techniques are scheduled for Thursday afternoon, and the papers for the final session on Friday morning will cover carbon black, reclaimed rubber and latex. Abstracts of the papers follow herewith:

Program of the

DIVISION OF RUBBER CHEMISTRY
AMERICAN CHEMICAL SOCIETY

Hotel Commodore—New York, N. Y.
September 17, 18, and 19, 1947

Wednesday Afternoon—September 17

2:00 P.M.—Introduction by W. W. Vogt (Goodyear), Chairman, Rubber Division, A.C.S.
2:05 P.M.—General Papers.
4:10 P.M.—Business Meeting.

Thursday Morning—September 18

9:00 A.M.—General Papers.

Thursday Afternoon—September 18

2:00 P.M.—General Papers.

Thursday Evening—September 18

5:30 P.M.—Cocktail Party.
7:00 P.M.—Divisional Banquet, Hotel Commodore.

Friday Morning—September 19

9:00 P.M.—General Papers.

ABSTRACTS OF PAPERS

Wednesday Afternoon—September 17

2:05 P. M.—Emulsion Polymerization of Isobutylene at Low Temperatures. *G. Bryant Bachman and H. B. Hass (Purdue University, Lafayette, Ind.) and E. J. Kahler (Battelle Memorial Institute, Columbus, Ohio).*

Emulsion polymerization offers advantages over bulk polymerization in that its rate is more easily controlled, localized superheating is prevented, and the quality of the copolymer obtained is often better and more uniform. Thus far, however, emulsion polymerization of hydrocarbons has been limited to aqueous systems and hence to temperature ranges above the freezing point of water.

In seeking to apply the emulsion technique to the preparation of Butyl (GR-I) rubbers at low temperatures (—70° or below) we have recognized the primary need for a solvent possessing all of the following characteristics: (1) m.p. —70° or below, (2) nonreactivity with polymerization catalysts (e.g., aluminum chloride or boron trifluoride), and (3) essential immiscibility with the hydrocarbon monomers at the temperature of polymerization. Until recently a solvent meeting all of these qualifications has not been available, but the wartime development of highly fluorinated organic liquids, especially the fluorocarbons, has made it possible to investigate and report on the emulsion polymerization of isobutylene-butadiene mixtures at low temperatures.

Emulsion polymerization of isobutylene and emulsion copolymerization of isobutylene-butadiene mixtures at low temperatures have been achieved with the aid of fluorocarbon liquids as dispersing media. Butyl rubbers obtained from the products of this process gave satisfactory physical tests. These preliminary experiments indicate the usefulness of liquid fluorocarbons as inert dispersing media for reactions involving unusual conditions.

2:25 P. M.—Low Water Absorption Copolymers of the Non-Staining, Superior Processing Type. *L. H. Howland, J. C. Madigan, E. R. Burns, and C. B. Bawn (U. S. Rubber Co., Naugatuck, Conn.).*

A paper presented in September, 1946, described the development, manufacture and use of GR-S-65, a low water absorption copolymer designed for wire and cable insulation. This material was shown to possess electrical properties superior to those of GR-S types in production at that time. Since then, responding to the growing demand for a non-staining GR-S and for non-staining processing aids for both GR-S and natural rubber, two new copolymers have been designed, developed and produced. Evaluations by these laboratories and by the trade have furnished data supporting their special value as improvements over standard GR-S and GR-S-65.

The first of these two new materials is designated X-392 SP, and varies from standard GR-S in that (1) acid-glue coagulation is used to minimize water-solubles and improve electrical stability; and (2) a new non-staining, non-discoloring stabilizer is substituted for the conventional antioxidant. The other is called X-393 SP, and varies from standard GR-S in the above two features, but in addition contains a controlled amount of "built-in" gel which is obtained by the use of a "crosslinking" agent. This copolymer possesses extremely good processing properties, and is used in blends with rubber, GR-S, GR-S-65, or X-392 SP to obtain the balance of processing and physical properties required for a given process and product.

While X-392 SP and X-393 SP were outgrowths of the development of GR-S-65 and GR-S-60, their use is not limited to wire and cable insulation. Wherever non-staining,[1] low water absorbing or superior processing qualities are important, they can be beneficially used. For example, present applications include fabric coating, molded mechanical goods and natural rubber footwear compounds. Evaluation data and description of the processes are given.

2:45 P. M.—Geon Polyblend. *J. W. Perloff and G. W. Flanagan (B. F. Goodrich Chemical Co., Rose Building, Cleveland, Ohio).*

Compatability with vinyl resins is a characteristic of nitrile-type polymers which has enabled them to be used with vinyl plastics. There has been a need for a vinyl plastic containing such a rubber as the sole plasticizer for applications where conventional plasticizers cause these plastics to fail due to extraction, evaporation, or migration. Geon Polyblend is such a plastic. This new material is a colloidal dispersion of Geon resin with a Hycar rubber. It is free from nerve and, at normal plastic operating temperatures, fluxes readily while retaining the necessary flexibility and mobility for fabricating processes.

Geon Polyblend can be used as follows: (1) As a thermoplastic material by fluxing the Geon Polyblend at temperatures of 280° F. to 350° F., in which case the Hycar polymer becomes the plasticizer for the Geon resin; (2) As a rubber polymer by mixing the Geon Polyblend on a cold mill and curing the Hycar portion of the Geon Polyblend in which case the Geon resin becomes the reinforcing pigment; (3) As a material for mixing either with vinyl plastic stocks as an extender, or with rubber stocks to improve their resistance to ozone, sunlight, solvents, and abrasion. In view of the above, Geon Polyblend is worthy of study as a new basic raw material.

To date, Geon Polyblend has only about 30% the light stability of a comparable vinyl plastic. However, it can be measurably improved by compounding with pigments which reflect or absorb light. A complete range of colors, including brilliant pastels, is obtainable. Besides being adaptable to the usual hot processing techniques, Geon Polyblend can also be used in high solids content solutions.

3:00 P. M.—Cured Synthetic Elastomer-Polyvinyl Resin Blends. *D. W. Young, D. J. Buckley, R. G. Newberg, and L. B. Turner (Standard Oil Development Co., Elizabeth, N. J.).*

Special techniques are presented on compounding and curing of butadiene-acrylonitrile type copolymers with high molecular weight polyvinyl chloride polymers and vinylidene chloride polymers. The butadiene-acrylonitrile copolymers, as well as butadiene-methacrylonitrile copolymer studied as vinyl resin plasticizers, varied in molecular weight and nitrile content. Some of the rubber-like copolymers used are known commercially as Perbunan NS 26, and Perbunan 35 NS-90. In the experimental work about 70 synthetic elastomer-vinyl type blends were made on a laboratory rubber mill and then cured under heat and pressure. The tests carried out on most of the compounds were as follows: 100% modulus, tensile strength, ultimate elongation, Shore durometer hardness, brittle temperature, specific gravity, weight loss, heat aging at 250° F., light aging, stiffness, and volume increase in A.S.T.M. Reference Fuels No. 1 and No. 2, A.S.T.M. Oil No. 3, and water.

It was found that the butadiene-acrylonitrile copolymers that contained 26 to 35% acrylonitrile formulated cured polyvinyl resin-rubber blends with higher tensile strength, higher 100% modulus, greater ultimate elongation to break, than rubbers with less acrylonitrile. However, the above properties were only found when the final products contained from 13 to 25% rubber. At higher concentrations of nitrile rubber, the tensile values and modulus values for the cured rubber-resin blends were about the same. A number of the cured products had excellent thermal and light stability, toughness and chemical inertness.

Results indicate that certain precautions must be followed in temperature of mixing and in the selection of compounding ingredients for the rubber-resin blends, such as accelerators and plasticizers, in order to obtain these unique properties.

3:20 P. M.—Plasticizers for Butadiene-Acrylonitrile Rubber. *Arthur W. Campbell and Philip F. Tryon (Commercial Solvents Corp., Terre Haute, Ind.).*

Various compounds containing nitrogen in the amide or imide form have been tested in synthetic rubber of the oil resistant types, with the emphasis on the butadiene-acrylonitrile type. The Firestone plastometer has been used throughout in this work. Several new types of plasticizers have been discovered, such as the alkyl-N,N-dialkylcarbamates, wherein no sulfur is involved. The effect of varying the structure in the various alkyl groups has been studied in some detail.

When the dialkyl acetamides were being investigated, the N,N-diisopropyl-acetamide proved to be a chemical curiosity. Diisopropylammonium acetate would not dehydrate, but distilled undecomposed. However, the corresponding amide had a strong camphor-like odor. The mono- and dialkylamides of mono- and dibasic acids are very effective plasticizers in Hycar OR.

The alkyl and hydroxyalkyl imides proved to be very effective plasticizers. The various phthalimides were of interest, with the non-cyclic acid, succinic acid, producing imides of even more value than the corresponding amides.

A method of preparing various mixed amides from succinimide has been discovered. The esters of hydroxymethyl oxazolines are very effective plasticizers. These materials are prepared from the nitroparaffins through a series of reactions.

3:40 P. M.—Properties of Lactoprene EV Elastomer: Effect of Plasticizers. *W. C. Mast and C. H. Fisher (Eastern Regional Research Laboratory, Philadelphia, Penna.).*

Lactropene EV, a 95% ethyl acrylate-5% chloroethyl vinyl ether copolymer, is now being made on a pilot plant scale by the University of Akron Government Laboratories. In a study of plasticized Lactoprene EV compositions, the following plasticizers, listed in order of decreasing efficiency, were found to be most effective for lowering the brittle point: Thiokol TP-90B, Thiokol TP-95, Flexol 400, butoxyethyl diglycol carbonate, Flexol 3GH, and Flexol CS-23. (The use or mention of particular brands of material should not be construed as an endorsement or recommendation of these brands over others not mentioned.) These are all solvent plasticizers of the polyether formal or ether-ester type. Non-solvent plasticization (blending with certain other elastomers) and internal plasticization (copolymerizing with higher n-alkyl acrylates) were also studied. Relationships between resilience, swelling in plasticizer, and brittle points were observed.

3:55 P. M.—Pliolite Latex 190 in Latex Compounding. *J. A. Weatherford and F. J. Knapp (Goodyear Tire & Rubber Co., Akron, Ohio).*

This paper describes the use of Pliolite Latex 190, a highly stable water dispersion of a high styrene copolymer resin, in latex compounding. It has a solids content of approximately 30%, contains an anti-oxidant, and is stabilized so that it may be added to other latices. It imparts valuable reinforcing properties when added to natural and synthetic rubber latices. Its light color and low specific gravity when dry enables it to be used where darker and heavier reinforcing agents cannot be used. It can be used in the production of many items where stiffness is desired without losing the inherent toughness of rubber.

Pliolite Latex 190 was added in quantities of 0, 10, 15, and 20 parts to natural rubber latex, Neoprene Latex Type 571, GR-S Type III Latex (normal solids and creamed), Chemigum Latex Type 101 (a butadiene-styrene copolymer), and Chemigum Latex Type 200 (a butadiene-acrylonitrile copolymer). Data and graphs are presented illustrating the effect upon stiffness, hardness, tensile strength, elongation, tear strength, permanent set, and water absorption of the above latices.

Pliolite Latex 190 imparts reinforcement to other latices as shown by increased stiffness, hardness, and tear resistance. The water absorption is improved and in most instances the tensile strength is increased. The elongation is affected only slightly but the permanent set is increased.

4:25 P. M.—Polymerization Inhibition and Stopping Agents. *B. F. Kluchesky and L. B. Wakefield (Firestone Tire & Rubber Co., Akron, Ohio).*

In emulsion polymerization systems for the copolymerization of butadiene and styrene, an optimum conversion of monomer to polymer exists beyond which the polymer becomes increasingly dry and lifeless. This change is associated with the formation of cross-linked, insoluble polymer, which does not readily break down upon milling. Since polymerization may occur after the charge has left the reactor and is being treated for the recovery of unreacted monomers, the addition of a polymerization inhibitor to the system at the optimum conversion has been found necessary. The most common stopping agent is hydroquinone; others which have found use are tetramethyl thiuram disulfide, sodium sulfide and diphenol sulfide. The stopping action exerted by a compound may be the result of polymer chain termination and destruction of initiator, or chain termination alone. If the terminating effect is great enough, the solubility of the compound is unimportant; but for benzenoid compounds oxidizable to quinones, a certain extent of water solubility is desirable.

4:45 P. M.—The Influence of Cloud Points of Coumarone-Indene Resins on Their Use in Rubber Compounding. *Palmer B. Stickney, LaVerne E. Cheyney, and Paul O. Powers (Battelle Memorial Institute, Columbus, Ohio).*

Commercial coumarone-indene resins employed in typical stocks at varying concentration indicate that cloud point of the resin is an excellent index of the softening action of such resins in uncured stocks as measured by Williams plasticity of the uncured rubber. There is a critical cloud point at which no change of Williams plasticity occurs with change in resin concentration over a limited concentration range; this critical cloud point varies with the polymer used, increasing with the polarity of the polymers studied.

Hardness of the vulcanizates varies in a similar manner. The critical cloud point for hardness is lower than that for plasticity. It is suggested that this variation is due to variation in degree of dispersion of the resins, which varies with variation in cloud point. The lower critical cloud point for hardness of the vulcanizates reflects the decreasing solubility of the resin as the polymer is vulcanized.

Tensile properties of the vulcanizates vary widely with resin type, low cloud point resins, in general, giving higher tensile strength, greater elongation and lower modulus. High cloud point resins change the character of the stress-strain diagram from that of a rubbery material toward that of the plastic state.

The resins used showed a marked cure-retarding effect in GR-S and natural rubber, but only very slight effect in a nitrile rubber. The retardation varied widely, being greatest for low cloud point resins. It is probable that this retardation is due to the unsaturation of the resins. The reason for the slight effect of the resins on the cure of the nitrile rubber is not apparent.

Thursday Morning—September 18

9:00 A. M.—Improvements in Rubber Testing in the Government Synthetic Rubber Program. *Robert D. Stiehler (National Bureau of Standards, Washington, D. C.) and Richard W. Hackett (Office of Rubber Reserve, Reconstruction Finance Corporation, Washington, D. C.).*

In the Government synthetic rubber program, the standard deviation of testing rubber has been markedly reduced. The values of the standard deviations obtained at the beginning of the program in 1943 and 1944 were two to fifteen times as large as those obtained at present. The degree of improvement in precision depended on the property being evaluated and the technique of the laboratory personnel.

The improvement in the precision of testing rubber resulted from: (1) Standardization and improvement of technique, (2) Refinement of existing methods of test, and (3) Development of improved methods of test. Each of these approaches is reviewed. Some of the new methods of test that have been developed are: (1) Pyrolysis method for the determination of carbon black content of GR-S black mixtures, (2) Ultraviolet absorption method for the determination of stabilizer content of rubber, (3) Refractive index method for the determination of the bound styrene content of GR-S polymers, and (4) Constant stress method for determining the stress-strain properties of rubber.

The results which have been realized in this program indicate that a high degree of precision can be obtained in the testing of rubber if care is taken to control test conditions. The attainment of such precision has been achieved without a significant increase in man-hours or equipment-cost.

9:20 A. M.—A Convenient Method for Preparing Tread Stock To Be Road Tested. *S. R. Harrison (Firestone Tire & Rubber Co., Akron, Ohio).*

A semi-laboratory method for building test tires with treads half control and half experimental stock is discussed. The tread stocks were mixed in the laboratory and the half treads pressed into shape in a laboratory mold, as opposed to factory mixing and whole tread extrusion. The building and curing operations for the half and half treads were carried out in the factory as in the case of factory extruded whole treads.

The advantages of half-and-half test tires are multiple. Economy in materials consumed, man-hours and testing space, less variation in construction, and testing convenience in scheduling in the factory are realized. In addition, it is possible by using this method to evaluate polymers in actual road tests which would have been rejected on the basis of laboratory tests, thus allowing a better correlation of laboratory and road test data.

Road testing data on 6:00-16 half-and-half tires presented along with data on 9:00-20 whole tires show half-and-half tires give comparative wear ratings very similar to those obtained with whole tires for several special polymers.

9:40 A. M.—A Study of Abrasion Resistance by a Modified Method. *T. R. Griffith, E. B. Storey, J. W. D. Barkley, and F. M. McGilvray (National Research Council, Ottawa, Canada)*

The abrasion resistance test of GR-S commercial recapping compounds, carried out according to the regular A.S.T.M. procedure, was found to give results which did not agree with road tests. This is due to the formation of a viscous film on the abrasive and on the abraded rubber surface which lubricates the abrasive and leads to a ridiculously low abrasion loss. Extraction of the vulcanized rubber, prior to abrasion, with ethanol-toluene azeotrope prevented the development of this film and brought about excellent correlation with road tests.

The contamination was not so apparent with footwear compounds as with tread compounds, but it was obvious from the results, although there were no road tests to confirm this conclusion, that footwear compounds often show a considerable error in the laboratory test, which can be corrected only by extraction. Natural rubber showed the same error, but to a lesser extent than GR-S.

A study of this effect in various types of compounds led to the conclusion that softener in the compound contributes only in a minor way to the contamination, and that the main cause is probably depolymerized rubber developed during vulcanization. Reasons are advanced for the theory that the rubber being abraded on the road is actually extracted rubber because extractible material is probably wiped off on the road before appreciable abrasion occurs, and plays no direct role in the abrading process.

10:05 A. M.—Measurement of Resistivity in Conductive Rubbers. *Arthur C. Hanson (Rock Island Arsenal, Rock Island, Ill.).*

The measurement of resistivity of conductive rubbers is affected by the compounding ingredients, the distribution of these ingredients, the amount of flexing, electrode contact resistance, the relative humidity, the temperature, and the age of the sample. The type of carbon has the greatest influence on conductivity as the crystalline type, such as acetylene black, imparts conductivity to a marked degree. The channel blacks of smaller particle size also impart conductivity but this property changes only slightly on loading. Milling or mixing for better

distribution decreases conductivity when acetylene blacks are used but has little effect on channel black stocks.

A method of measuring the volume resistivity that eliminates the high electrode contact resistance of other methods consists of measuring the potential drop along a portion of the sample while a current is passing through the sample. This involves using a double electrode system with two separate circuits—one a current circuit, and the other a potential or measuring circuit. The method is a combination of the National Fire Protective Association of Canada and the B. F. Goodrich Company's methods.

Using a heat treatment to eliminate the effect of flexing, storing in a dessicator and testing at a standard temperature, the method gives results that may be used as an indication of relative value of compounds as conductors in actual service.

10:25 A. M.—The Effect of Copper on the Accelerated Aging of Neoprene Compounds. ***L. R. Mayo, R. S. Griffin, and W. N. Keen (E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.).***

The use of neoprene in direct contact with metallic copper wire is one of the new methods of construction being considered by the insulated wire industry. This paper presents preliminary observations on the effect of copper and copper compounds on the accelerated aging of neoprene vulcanizates, and indicates that a neoprene stock can be compounded for successful use on bare copper wire, thus eliminating the necessity of using tinned wire in many applications. The following specific conclusions are based on physical properties retained after aging in the 70° C. air oven and the 70° C. oxygen bomb:

1. Any neoprene compound should contain an antioxidant to insure good aging, and whenever contact or contamination with copper is anticipated the use of an antioxidant is particularly important.

2. A neoprene insulation compound containing an antioxidant and extruded directly over a bare copper conductor deteriorates only slightly faster than it would if extruded on tin coated copper wire. If the compound is further protected by the addition of a copper inhibitor, aging characteristics over tinned or bare copper wire are essentially equal.

3. Supplementary work involving exposure of neoprene compounds to copper in other forms is in agreement with results on wire. This includes the effect of contact with copper dust and copper bearing alloys, and also the effect of adding a neoprene-soluble copper compound, e.g., copper stearate, to the stock during mixing.

4. It is believed that the only mechanism by which metallic copper can affect the aging of neoprene is through its prior conversion to a neoprene soluble form and that increasing concentrations of copper in this form accelerate the oxidation of the vulcanizate proportionally.

10:45 A. M.—Oxidation and Thermal Decomposition of Selected Elastomers in Air. ***Glenn S. Skinner and James H. McNeal (University of Delaware, Newark, Del.).***

Neoprene, 1,3-butadiene-acrylonitrile copolymer, GR-S, and natural rubber vulcanizates undergo exothermic decomposition when rapidly heated to about 300° C. Various compounding agents may modify this reaction but do not eliminate it. The intensity of the exothermic reaction of neoprene is increased by zinc and magnesium oxides but decreased by MPC black. Higher temperature maxima result from increased heating rates. Polythene gives no exothermic reaction.

The exothermic reaction of all elastomer samples is preceded by the evolution of sufficient smoke to obscure visibility. Complete extinction occurs at a point between the beginning and the maximum intensity of the exothermic reaction. The natural rubber and GR-S samples give fluctuating smoke densities. The smoke density determinations were made with the aid of a standard sealed-beam headlight, a Weston light meter (Model 614), and a smoke chamber 22 inches in length.

The smoke from all elastomers is usually white. The neoprene samples compounded with zinc and magnesium oxides give a yellow to black smoke. This colored material, upon cooling, gradually condenses to a colored liquid leaving a white smoke.

The vapors from all of the elastomers flash when the metal container is rapidly heated to approximately 420° C. The vapor from neoprene is essentially non-inflammable and extinguishes the pilot light. The vapor from the others flashes back to the sample which continues to burn.

The effects of heating below the exothermic decomposition temperature and the initiation of the exothermic reaction by intense local heating are also reported. Exothermic decomposition of neoprene is characterized by the copious evolution of hydrogen chloride but very little is evolved prior to this. Phosgene was not found. Similarly the 1,3-butadiene-acrylonitrile copolymer gives hydrogen cyanide and natural rubber gives saturated hydrocarbons. The theoretical implications are discussed.

11:10 A. M.—The Determination of Free Carbon in Compounded Rubber and Synthetic Elastomers. ***George D. Louth (Firestone Tire & Rubber Co., Akron, Ohio).***

A literature survey fails to show a general method for the determination of carbon black in both natural rubber and all types of synthetic elastomers. A.S.T.M. methods D297-46T for rubber and D833-46T for synthetic elastomers are not applicable to the determination of free carbon in butyl rubber. Published methods for the estimation of black in vulcanized butyl rubber [*The Analyst*, Vol. 71, p. 505 (1946)] and in butyl rubber reclaim [*Ind. Eng. Chem. Anal. Ed.*, Vol. 18, p. 522 (1946)] are lengthy and limited in application.

The method proposed by this paper is rapid, accurate and is applicable to all types of vulcanized stocks, including butyl rubber. In this method the sample is softened in boiling tetrachloroethane and boiling nitric acid is added to decompose the elastomer. The cooled mixture is extracted with ether, leaving the nitric acid and black as a residual layer in the beaker. This layer is diluted with acetone or an acetone-ether mixture and poured into a Gooch crucible partly filled with ether. The coagulated black is thoroughly washed, dried, weighed, ignited and calculated in the usual manner.

Unique features of the method are the use of tetrachloroethane-nitric acid for the quick decomposition of the sample and the use of ether to coagulate the carbon black and permit its quick filtration. Reproducibility using this method, even in the hands of different analysts inexperienced with the method, has been within ±0.5% on samples containing approximately 30% free carbon.

11:35 A. M.—Vulcanization of Synthetic Rubbers by the Peachey Process. ***Norman Bekkedahl, Fred A. Quinn, Jr., and Elmer W. Zimmerman (National Bureau of Standards, Washington, D. C.).***

The Peachey process, which vulcanizes natural rubber by subjecting it alternately to vapors of sulfur dioxide and hydrogen sulfide, has been found to vulcanize the more common synthetic rubbers. The polymers studied were natural rubber, GR-S, GR-M, GR-I, GR-A, Hycar OR-25, Hycar OS-10, Hycar OS-20, and Hycar OS-30.

The rubbers tested were milled to thin sheets and cut into small strips. These strips were placed on a screen gauze and inserted in a glass tube about three feet long having a triple inlet for admitting sulfur dioxide, hydrogen sulfide, and air. The vulcanizing gases were each passed slowly through the tube for five minutes and each was followed by a brisk sweep of air for about ten seconds in order to remove the uncombined gases.

This cycle of operations was repeated a number of times on each of the polymers. In some cases as many as 128 cycles were performed. After exposure the samples were weighed to determine the total amount of sulfur added, qualitatively evaluated by hand-stretching as to the state of cure, and finally some were quantitatively analyzed to determine the amounts of free and combined sulfur.

Good cures were obtained with all of the polymers except GR-M. None of the synthetic rubbers cured any faster than natural rubber. The nitrile rubbers and the styrene rubbers cured at about the same rate or somewhat slower. GR-I required roughly fifty times as long as natural rubber for an equivalent cure, while GR-M required even longer.

Thursday Afternoon—September 18

2:00 P. M.—Improved Processing GR-S by Variations in Compounding. ***R. A. Crawford (B. F. Goodrich Co., Akron, Ohio) and G. J. Tiger (University of Akron, Akron, Ohio).***

A compounding study was made in an attempt to prepare a stock having the excellent processing properties of divinylbenzene cross-linked polymer (GR-S-60) and the stress-strain properties of standard GR-S. Investigation of Banbury mixing of stocks containing GR-S-60 and GR-S-60/GR-S blends indicated that mastication at high dump temperatures (in the vicinity of 380°F.) would seriously degrade both the processing and stress-strain properties of these compounds.

Banbury treatment of GR-S at 380° F. for five minutes in the presence of 0.5 part of sulfur, 1.5 parts of Captax and 50 parts of carbon black, but prior to mixing with other materials, gave an easy processing stock that was superior to Banbury mixed GR-S-60 in both processing and stress-strain properties as judged by laboratory methods, including the Garvey die extrusion test. In addition, the processing properties of this compound very closely approached, and the stress-strain properties excelled, those of GR-S-60 which was mixed on a mill at lower processing temperatures.

With other combinations of cross-linking agents, the best results were obtained from five-minute mixing at 380°F. with Amberol ST-137; Butyl Eight, sulfur and Captax; Durez Resin No. 12687 and Captax; Telloy or Vandex, zinc oxide and sulfur; ethyl tuads; thio-beta-naphthol and sulfur; or Polyac.

Applied on a commercial scale, this treatment would involve little, if any, additional processing in the preparation of tread stocks and no new compounding materials would be required. The stock would be completely compounded and prepared for the extruders in a single Banbury cycle.

2:20 P. M.—The Role of Adsorption in the Reinforcement of GR-S. ***C. E. Barnett and H. C. Jones (New Jersey Zinc Co., Palmerton, Penna.).***

The reinforcing properties of non-carbon pigments in natural rubber and GR-S are quite dissimilar. There is considerable compounding evidence that the surface activity of a pigment is important in determining its ability to strengthen GR-S, while in natural rubber the surface area of a pigment seems to have a more dominant influence on reinforcement than does its surface activity.

Previously reported experiments demonstrated that acetone extracted GR-S develops substantially better physical properties with non-carbon fillers than regular GR-S. These results suggested that the short-chain materials in GR-S were responsible for the inferior properties, and other methods of rendering these components ineffective were considered. More recent experiments have indicated that similar results can be achieved by compounding GR-S with surface-active pigments which adsorb some of the lower molecular weight material in GR-S. These observations are substantiated, at least in part, by experiments in which dilute solutions of GR-S are mixed with the pigments and the properties of the adsorbed and unadsorbed fractions of GR-S are evaluated after the pigment has been separated.

These data are presented with the thought that they might suggest further experiments leading to the development of improved synthetic elastomers.

2:40 P. M.—Physical Properties of Fractions of GR-S and Their Vulcanizates. ***John A. Yanko (B. F. Goodrich Co., Akron, Ohio).***

A large scale precise fractionation of GR-S (X-55) was performed using the fractional precipitation technique at 25° C. Nine fractions, each weighing approximately 150 grams and comprising approximately 11% by weight of the original unfractionated sample, were obtained and a detailed study was made showing the effect of number average molecular weight and related sol-gel properties on various physical and chemical properties of the crude and vulcanized fractions.

Using a Santocure tread-type recipe, preliminary compounding work indicated the sulfur ratios required to give vulcanizates with 300% modulus values of 1000 psi. All fractions were recompounded using these indicated optimum sulfur values. Generally, as the number average molecular weight increased, better stress-strain and quality index data were obtained. These and other physical properties of the vulcanizates of these fractions are discussed in detail.

As found in past fractionation studies pertaining to unsaturated high polymers, the higher molecular weight fractions obtained from the unfractionated sample which was totally soluble in benzene undergo considerable gelation when isolated and vacuum dried at 25° C. in the dark. As the indicated molecular weight of the fraction increased, higher percent gel contents were obtained. Compared to unfractionated butadiene-styrene copolymers of similar gel contents, the gel portions of the higher molecular weight fractions had unusually high swelling indices, indicating qualitatively that the average molecular weights between points of effective cross-linking in the three dimensional gel structure were higher than those encountered in the past in unfractionated samples of similar gel contents.

Using osmometric technique, the number average molecular weights of the benzene soluble portions of these fractions were determined and the relationship of $[\eta]_o$ to the number average molecular weight was determined. Other data are given pertaining to these fractions, such as the bound styrene content, percent shrinkage of the compounded unvulcanized stocks, and the rate of gel breakdown with cold milling.

3:05 P. M.—Copolymers of Butadiene with Ring Chlorinated Isopropenyl Benzenes. ***R. E. Metzger, G. Reymond, R. Rongone, Betty Sobel, G. H. Stempel, and K. Weinstock (General Tire & Rubber Co., Akron) and R. B. Cross, W. E. Hake, and W. Woodland (Carnegie Institute of Technology, Pittsburgh, Penna.).***

The following chlorinated isopropenyl benzenes have been prepared: c-chloro, m-chloro, p-chloro, 2,3-dichloro, 2,4-dichloro, 3,4-dichloro, and 3,5-dichloro. Laboratory methods used for their preparation are discussed. It has been found that, unlike the chlorinated styrenes, all of these materials are quite resistant to homopolymerization. They can therefore be handled with ease during their preparation and purification without difficulty from premature polymerization.

The mono- and dichloroisopropenylbenzenes which do not contain a chlorine group ortho to the isopropenyl group copolymerize in emulsion with butadiene to yield rubbery polymers having physical properties superior to those of GR-S. The polymerization recipes and the compounding recipes will be discussed along with the physical properties of the compounded rubbers as compared to those of alphamethylstyrene-butadiene and dichlorostyrene-butadiene rubbers, and GR-S.

Data concerning the rate of entry of the dichlorinated isopropenyl-benzenes into the polymer are given along with a refractive index method for determining the amounts of dichloroisopropenylbenzenes present in a butadiene copolymer.

3:25 P. M.—2-Benzothiazyl-N,N-Disubstituted Thiocarbamyl Sulfides as Vulcanization Accelerators. ***G. M. Wolf and C. C. de Hilster (Sharples Chemicals, Inc., Wyandotte, Mich.).***

Benzothiazoles and thiuram sulfides represent two classes of vulcanization accelerators which have been widely and advantageously employed in the rubber industry for many years. The essential structure of each of these two classes of accelerators may be incorporated in a single molecular form, the simplest representatives of which are the 2-benzothiazyl-N,N-disubstituted thiocarbamyl sulfides. These have the structure represented by

$$\begin{array}{l} \text{R-S-C-NR'R''} \\ \quad\quad\; \| \\ \quad\quad\; \text{S} \end{array}$$

where R is a benzothiazyl group, and -NR'R" is a secondary amino group. A compounding survey of this class of compounds has shown them to be powerful vulcanization accelerators exhibiting a desirable delayed action. Vulcanizates have been prepared with these materials in natural rubber, GR-S, GR-A, and GR-I.

The 2-benzothiazyl-N,N-disubstituted thiocarbamyl sulfides disperse readily in natural rubber and GR-S, where they func-

tion as primary self-activated accelerators. Small amounts afford effective vulcanization, producing vulcanizates with good stress-strain properties, tear and cut-growth resistance, and good aging characteristics.

A number of the 2-benzothiazyl-N,N-disubstituted thiocarbamyl sulfides, such as the N,N-dimethyl, -diethyl, -dibutyl, N-ethyl-N-phenyl, and N-cyclopentamethylene derivatives have been investigated in natural rubber and GR-S. The N,N-diethyl derivative, one of the most active of the group, has been more thoroughly studied in natural rubber, gum and tread stocks, as well as in GR-S tread stocks. Vulcanizates cured with 2-mercaptobenzothiazole and N-cyclohexyl-2-benzothiazyl sulfenamide have been included for comparative purposes.

3:45 P. M.—Relationship of Rayon Tire Cord Dip Pick-up, Cord Adhesion and Flex Life of Passenger Tires. *R. T. Murphy and L. M. Baker (Mansfield Tire & Rubber Co., Mansfield, Ohio).*

Previous papers have attempted to show the effect of cord dip composition and amount of dip deposited upon adhesion between rayon cord and rubber stocks. Much emphasis has been placed upon adhesion value; however, this work is an attempt to show the relationship between quantity of dip deposited, adhesion value and flex life in tires. Two series of tire tests were run to determine the effect of GR-S Type III Latex and reclaimed rubber dispersion dips upon flex life of rayon tire cords. The performance of the tires upon wheel tests has shown a marked relationship between adhesion, dip deposit, and tire life. The results have indicated that tire flex life is improved by lower dip pick-up even though cord adhesion values have been reduced.

Friday Morning—September 19

9:00 A. M.—The Ultimate and Actual Tensile Strengths of Type III Latex Films. *S. H. Maron, B. Madow, and J. C. Trinastic (Case Institute of Technology, Cleveland, Ohio).*

A comparative study was made of the tensile strengths of raw polymer and gum vulcanizate films prepared from 53 Type III GR-S latices. The ultimate tensile strengths of the two types of films showed no correlation with each other when the calculations were based on the original cross-sectional areas. On the other hand, when the calculations were made on the actual areas at break, the tensiles of the raw polymer and vulcanizate films obtained from a given latex were found to be essentially the same. This identity of film tensiles obtained from a given latex indicates that here compounding and curing does not lead to any reinforcement of the polymer, nor to any change in the nature of the bonds involved in film rupture.

9:25 A. M.—Studies on Carbon Black. II. Grignard Analysis. *D. S. Villars (Jersey City Junior College, Jersey City, N. J.).*

Different types of tightly bound oxygen on carbon black have been distinguished by Grignard Analysis. Carbonyl oxygen tends to be from 13 to 30% greater in amount than hydroxyl oxygen for all blacks. About 26% of the total content of tightly bound oxygen is accounted for by Grignard Analysis. The greater part of the oxygen on the black is thus more or less chemically inert. Comparison of the different types of oxygen liberated on heating to 1000° C. with the types existent on the surface at room temperature show order of magnitude correlation between oxygen liberated as water above 950° and hydroxyl oxygen. There is no correlation among the other types of oxygen. This seems to justify the conclusion that the distribution of oxygen (other than hydroxyl) obtained from the analysis at 1000° is defined by the pyrolytic equilibrium established on heating to 950 to 1000°. It has no relationship to the distribution of bonds prevailing naturally upon the black before it is heated. Although the great majority of the oxygen is unreactive towards Grignard, the minor reactive part may well be of importance to the behavior of carbon black in rubber.

9:45 A. M.—A Critical Comparison of a Highly Reinforcing Furnace Black with Easy Processing Channel Black. *C. A. Stokes and E. M. Dannenberg (Godfrey L. Cabot, Inc., Boston, Mass.).*

The efficiency of operation and the high degree of product control inherent in the furnace process for the manufacture of carbon black will result in the gradual obsolescence of the older competitive channel process. It is therefore of great importance that the rubber technologist have a fundamental understanding of the basic structural relationships between the types of reinforcing carbon blacks produced by these two different processes. This paper presents data showing these relationships between a highly reinforcing furnace black and an easy processing channel black. The processing characteristics and physical properties of rubber stocks obtained using these two types of black in a typical tire tread recipe is also described. A critical comparison of the highly reinforcing furnace black with the channel black is made on the basis of the fundamental structural data and the rubber data obtained.

Basic structural information on the furnace and channel black was obtained from electron microscope studies, and consists of particle size and particle size distribution data as well as observations on the tendency of the primary particles to form aggregates. The extent and nature of the carbon surfaces were determined by a number of different techniques, including the Brunaur, Emmett and Teller method of low temperature nitrogen adsorption; liquid phase adsorption of iodine and diphenyl guanidine; differential heats of adsorption using nitrogen and gaseous hydrocarbons as adsorbates; and determination of the amount and composition of the volatile matter liberated on high temperature heating of the blacks.

Rubber properties of these blacks were studied in natural and synthetic rubber. Laboratory abrasion results and their correlation with actual roadwear performance are emphasized. On the basis of all the available information, it is concluded that furnace blacks are not only completely adequate as replacements for channel black in rubber tires but actually possess many attractive advantages over the channel blacks.

10:10 A. M.—The Vulcanizing Characteristics of Reinforcing Furnace Carbon. *D. F. Cranor, J. W. Snyder, and A. G. Cobbe (Binney & Smith Co., New York, N. Y.).*

The high quality of fine furnace carbon as already developed for rubber compounding assures the future of this product, particularly in view of the efficiency of the manufacturing process and the present day economics of natural gas. A major difference between the compounding behavior of reinforcing furnace carbon and channel black lies in the differing effects on rate of vulcanization. A full appreciation of this difference and the available means of approach toward reconciling these effects is essential to the best practical use of the furnace product.

Data are presented showing chemical evidence, as well as physical test results, to establish the cure behavior of the two types. Reticulate chain structure is discussed in connection with the possible danger of confusing the modulus increase which structure produces with indication of the physical state of cure. The question is brought up as to whether identical state of cure represents the optimum for tread compounds containing both types of carbon and certain evidence is offered indicating that a somewhat more advanced state of cure can be tolerated with fine furnace carbon.

The fundamental effects of organic accelerators on GR-S and natural rubber treads containing reinforcing furnace carbons are shown. The processing difficulties which follow the use of excessive proportions of accelerator in Hevea rubber are considered and conversely the dangers associated with excessive reduction are brought out.

Suggested means of maintaining safe ratios of accelerator through the use of chemical retardants and retarding softeners are included, and a broad compounding approach based on present day knowledge is advanced.

10:35 A. M.—Basic Reactions Occurring During Reclaiming. I. The Influence of Temperature, Antioxidant, and Defibring Agents on Natural Rubber. *D. S. le Beau (Midwest Rubber Reclaiming Co., East St. Louis, Ill.).*

Although the reclaiming of rubber has been an art practiced by industry for many decades, its fundamental processes have hardly changed during that time and very little basic work in regard to the reactions occurring during the reclaiming process has been done. The present systematic study deals with the effect of the surrounding atmosphere during the reclaiming process as well as the effects of antioxidant, alkali and metallic chloride defibring agents on the rubber hydrocarbon itself. Data are presented on the acetone and chloroform extracts and the unsaturation of a vulcanized natural rubber compound subjected to reclaiming by the pan process and digester process in the presence of water, alkali, or metallic chloride solutions over a range of up to 16 hours of reclaiming at 194° C.

The practical differences between alkali and metallic chloride defibred reclaims so well known to the reclaimer and rubber compounder find their counterpart in the differences of the respective analytical data obtained from each reclaim. The defibring agents while fulfilling their purpose exert a very definite influence on the course of the reclaiming reactions occurring within the rubber hydrocarbon itself. This influence is specific to the nature of the defibring agent. The role of oxygen during the reclaiming process is analyzed and the results are discussed on the basis of hydroperoxidic oxidation reactions.

11:00 A. M.—A Method for Determination of Surface Area and Particle Size of Latex. I. Application of Type II GR-S Latex with Neutralized Fatty Acid. *S. H. Maron, M. E. Elder, and Irwin N. Ulevitch (Case Institute of Technology, Cleveland, Ohio).*

A method is described for determination of the average surface area and particle diameter of rubber in a latex. Two techniques have been developed for detection of the surface saturation point. Both involve the titration of latex with standard soap solution, but in one the saturation point is detected by surface tension measurements, while in the second by electrical conductance. The results obtained by the two methods are concordant, and they permit correction for the amount of unadsorbed soap in a latex.

Using the above method, the surface areas and average particle diameters have been evaluated for three Type II latices with neutralized fatty acid. With two of these latices six different soaps were used, while with the third five soaps. The results show mean deviations ranging from 1.0 to 2.4% in particle diameters of each latex. A simplified method is described by which approximate but satisfactory results for surface area and particle size can be obtained more quickly than by use of the more elaborate method.

11:25 A. M.—A Process for Concentrating Latex. I. Concentration of Type III GR-S Latex by Use of Sodium Chloride. *S. H. Maron, C. Moore, J. G. Kingston, I. N. Ulevitch, J. C. Trinastic, and E. H. Borneman (Case Institute of Technology, Cleveland, Ohio).*

A process for rapid concentration of GR-S latex has been developed which involves gelation of a latex by addition of electrolyte and cooling, and subsequent processing of the mix to yield a fluid and rapidly filterable mass. The filter cake of polymer gel obtained reverts readily on warming to room temperature to stable latices of 60-70% solids contents. When processing is right, the serum removed is free of polymer.

The present paper describes the application of the process to Type III GR-S latex and sodium chloride as the added electrolyte. With this latex and electrolyte, concentrates have been prepared which are exceptionally stable, and which at 60% solids show all the characteristics of a good latex. Analysis of the products shows that 7-20% of the soap in the processed latices passes into the serum, as well as 60-80% of the added electrolyte. As a result of the small quantity of residual electrolyte in such concentrates, they exhibit gel points below room temperature.

Wartime Production of German Polyvinyl Chloride Materials

THE German polyvinyl chloride materials, known as "Igelits" and "Vinnols," used for cable insulation, rubber substitutes and synthetic coatings, were produced by emulsion and suspension polymerization processes, according to a report for sale by the Office of Technical Services of the U. S. Department of Commerce.

In 1944, when polyvinyl chloride became important for cable insulation and as a rubber substitute for use within moderate working temperatures, over 32,000 tons of "Igelits" were produced by I. G. Farbenindustrie's emulsion process and 3,600 tons of "Vinnols" by the Alexander Wacker suspension process. Germany had an abundance of the raw materials necessary to manufacture the vinyl chloride monomer, the hydrogen chloride and the acetylene used in the production of polymers and copolymers. The common organic catalyst was benzoyl peroxide and the inorganic catalyst, hydrogen peroxide.

A number of excellent polymers and copolymers of varying molecular weights were produced by Farben at Ludwigshafen, under the trade names "Igelit PCU" and "Igelit MP." Low, medium and high molecular weights were achieved in each group through accurate temperature control throughout the two-stage continuous polymerization process. Both reaction vessels were cooled by refrigerated brine circulated in the cooling jackets. In addition, an agitator blade in the first reaction vessel aided in temperature control. The blade gave a degree of circular agitation strong enough to provide a stable motion but not severe enough to break the emulsion.

Five "Vinnols" of varying molecular weights were produced by the suspension process at the Alexander Wacker Works in Burghausen. Three with no active emulsifier were used for manufacturing boot soles, bicycle tires, joints and cable insulation. The others with two percent emulsifier were used mainly for tire tubes.

The polymerization of "Vinnols," with benzoyl peroxide as the catalyst, was also controlled by liberation of heat and by the time of reaction, which was usually 60 hours for 95 percent polymerization. Reaction heat was dissipated by a paddle-type agitator, speedier than the agitator blade used at Ludwigshafen. Water at 50°C. was used to cool the asbestos-packed, graphite-lubricated stuffing box and the polymerization vessel.

Complete details of the emulsion and suspension processes are given in the report which also contains flowsheets, standards set up for control tests and information on a test to determine the number of long chains in the polymers.

Orders for the report, entitled "Polyvinyl Chloride Production at Burghausen and Ludwigshafen" (PB-44674; 32 pages; microfilm, $1.00; photostat, $3.00) should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order, payable to the Treasurer of the United States.

Editorials . . . . . .

Patent Pools

AT the outbreak of World War II it was evident that immediate action had to be taken with regard to the various patents in existence to enable the government to launch its gigantic synthetic rubber industry. Accordingly, in an amazingly short time, four general agreements, usually referred to as patent pools, were concluded. Two of these involved butadiene patents, one styrene, and one copolymers. These agreements provided for the sharing of operating rights under the various patents and the exchange of know-how between the signatories. Each contained specific provisions as to when and how the agreements could be terminated.

Nineteen oil and chemical companies were parties to the first butadiene agreement, four oil companies were parties to the second butadiene agreement, and eight oil and chemical companies to the styrene agreement. Parties to the copolymer agreement, relating more closely to the actual manufacture of synthetic rubber, included Goodyear, Goodrich, U. S. Rubber and Firestone, among the rubber companies, and two oil companies, Standard Oil Co. (N. J.) and the Hydrocarbon Chemical Co., an affiliate of Phillips Petroleum.

Provisions as to termination were roughly the same in the case of the butadiene and styrene agreements. The signatories were bound to continue the agreements until termination of the national emergency or until termination of the last terminated plant operating agreement, whichever was earlier. Accordingly, these agreements were ended several months ago by a stroke of President Truman's pen. The copolymer agreement, however, was not to be terminated until the termination of the last of the copolymer special agreements, but in no case later than September 11, 1951.

Because of the special termination provision in the copolymer agreement the various signatories are naturally reluctant to acquire government-owned facilities until released from the cross-licensing and exchange requirements, since any such move would mean the purchaser would be unable to exploit exclusively his own technical developments. These signatories have long argued that the exchange provisions in the agreement, essential to the successful operation of the war, are now actually retarding the development of new and better copolymers.

Several months ago some of the signatories to the copolymer agreement suggested to the Office of Rubber Reserve that the agreement be "torn up." At that time the government agency rejected the proposal emphasizing the point that the pooling arrangement is essential so long as the government stays in the synthetic rubber business and foots the bill. Within recent weeks, however, a second attempt has been made. The new proposal is unique in that it seeks modification of the agreement only and has the approval of all six of the original signatories.

As indicated in the news pages of this issue, the terms of the second proposal are confidential. It is known, however, that it attempts to meet the original government objection by assuring the government that it will continue to benefit from any discoveries that can be put to use during the period of continued Federal ownership of the synthetic rubber plants, while at the same time it would enable the companies to pursue long-range projects at their own expense, the results of such projects to be put to commercial use after the government retires from the field. Presumably, the new proposal outlines measures under which "short-range" projects would be separated from the "long-range" ones. The word "presumably" must be stressed.

This same problem once occupied the attention of the now-defunct Inter-Agency Policy Committee on Rubber. Before its dissolution, the committee indicated that any solution to the problem presented by the copolymer agreement would have its disadvantages, but stated that the "least undesirable policy" would be to terminate the agreement as to future discoveries on a cut-off date, this date coinciding with the disposal of a block of the copolymer plants deemed to constitute "the nucleus of a healthy privately-owned industry."

It is generally agreed that some decision with respect to modification of the copolymer patent pool must be reached before proposals for permanent rubber legislation reach Congress early next year. Officials of Rubber Reserve are anxious to cooperate with industry in this instance, and we are sure they would gladly welcome any suggestions for a proper solution—even from Philadelphia lawyers.

CURRENT NEWS OF THE MONTH

MODIFICATION OF PATENT POOL IS SOUGHT BY MANUFACTURERS

Under the terms of the synthetic rubber patent pool signed in December of 1941 any new developments in copolymers containing 15% or more of butadiene achieved by any signer of the pact automatically must be made known to the government and made available to the other members of the pool. The pact also provides for the free exchange of improved know-how in manufacturing processes.

Signers of the original patent pool include Goodyear, Goodrich, U. S. Rubber and Firestone, as well as the Standard Oil Co. of New Jersey and the Hydrocarbon Chemical Co., an affiliate of the Phillips Petroleum Co., which has since retired from the commercial production of synthetic rubber, turning its activities in this direction over to the B. F. Goodrich Chemical Co.

The wartime cooperation of the rubber and oil companies involved in the patent pool has been remarkable, and the terms of the pact have been faithfully followed. In the present period, however, practically all of these companies are reluctant to pour their full resources into the development of new and better polymers so long as they are pledged to pool their information on research and production. Because of this situation, an attempt was made some time ago by the participants to have the original agreement terminated.

New Attempt Is Made

Within recent weeks another attempt has been made, this time in the form of a modification of the pact. It is understood that a proposal having the unanimous support of all of the companies involved has been submitted to the Office of Rubber Reserve. Although the terms of the proposed modification are confidential it is believed that it has a two-fold aim: (1) To assure the government that it will continue to benefit from any discoveries that can be put to use in the period of Federal ownership of the synthetic rubber plants, and (2) To assure the companies that they can pursue long-range projects at their own expense, keep such projects secret, and put them to use after the government retires from the synthetic rubber business.

Rubber Reserve officials have expressed puzzlement as to how long-range projects can be separated from immediate projects. They admit, however, that the present arrangement may retard research and development, and sympathize with the objectives of the companies. One major aim of Rubber Reserve is to make certain that the government will not be deprived of any developments which may enable it to produce lower cost or improved polymers in any interim period between government and private operation of the plants.

The government is anxious to dispose of its synthetic rubber plants, either by sale or lease, and turn operation over to private industry. Prospective purchasers, however, are not eager to make any definite bids until Congress decides what support the industry will receive after present controls expire. Such support is expected to be incorporated in the permanent rubber legislation now being planned for presentation to Congress after the turn of the year.

Prospective purchasers of government producing facilities naturally want assurance that they can operate such facilities without fear of infringing on any old patents. According to Rubber Reserve, the terms of the original patent pool cover that contingency, and officials of the government agency insist that such protection must be carried over into any modification which might be made. They point out that if the pool was simply terminated, it would open up the question of royalties, which would increase the cost of producing synthetic rubber.

Realizing that the job of framing permanent rubber legislation and disposing of the synthetic rubber plants will be more complicated unless the patent structure is solved beforehand, Rubber Reserve officials are known to be anxious to reach a settlement with the industry within the next few months.

Drop Premium Price

The Office of Rubber Reserve (RFC) has advised that there is no longer a premium price on black masterbatches made at the Institute, West Virginia, plant by the U. S. Rubber Co. Examples of this premium price are X-369, X-374, and X-378, which were indicated as premium priced polymers when originally published in this journal.

U. S. Wire Moves Plant

U. S. Wire & Cable Corp., whose plant at 334 Mulberry St., Newark, N. J., was recently damaged by fire, has moved its manufacturing facilities to new quarters in the rear of 27 Haynes St., Newark. Armand Sequeira is now president of the company, which manufactures both bare and insulated wire.

NEW LABOR PROBLEMS LOOMING AS UNION SEEKS WAGE INCREASE

New labor problems are looming on the rubber horizon as the United Rubber Workers of America (CIO) continues its activities to reopen the wage question and secure additional increases. At this writing it seems evident that bargaining on a Big Four basis has come to an end. Wage negotiations under this arrangement were accomplished early in 1946, when the workers were granted an 18½ cent hourly increase, and last March, when an 11½ cent an hour increase was approved.

Although the rubber union requested that the current negotiations, opened up under the terms of the last agreement, be continued on the same Big Four basis, Goodrich and Firestone have agreed to reopen the wage question on an individual plant basis, while Goodyear is prepared to discuss it on a company-wide scale. It is believed that U. S. Rubber will also consent to such discussion.

In an effort to force Goodrich to negotiate on a company-wide basis, seven locals of the rubber union approved a national strike against the company on August 9. Company contracts with these unions expire between August 14 and 18. The strike was scheduled to start on August 14 but on August 12 some 800 workers failed to report for work at the company's plant at Tuscaloosa, Alabama.

Negotiation Is Sole Issue

The sole issue behind the Goodrich strike, which is expected to interfere with operations at the Akron, Oaks, Clarksville, Cadillac, Miami, and Los Angeles plants, as well as the Tuscaloosa plant, is that of negotiating on a company-wide basis. The union leaders are pledged not to attempt to conclude separate agreements with the company covering their respective plants.

The agreement concluded at Cleveland, Ohio, last March, secured an 11½ cent an hour increase for the workers. Under its terms both sides, as of July 22, were permitted to reopen wage talks, and the union took advantage of this option.

In accepting the 11½ cent increase, last March, according to the union, the rubber workers accepted 3½ cents less than the "national pattern" of 15 cents set in other fields. Because of increases in the cost of living since the Cleveland meeting, union officials state, the rubber workers are entitled to more than just a 3½ cent increase now.

(EDITOR'S NOTE: The national strike against Goodrich was averted on August 13 because of a last-minute decision by the company to negotiate on a company-wide basis.)

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NEW MOLD CLEANING METHOD OFFERED TO RUBBER MANUFACTURERS

A new method of cleaning tire and mechanical goods molds was demonstrated in Akron, Ohio, recently. This method, developed jointly by Agicide Laboratories, Inc., of Los Angeles, and the Vacu-Blast Co., of Burlingame, Calif., was demonstrated under the sponsorship of The C. P. Hall Co. of Akron, Ohio.

Whereas conventional methods for cleaning tire molds are often costly, hazardous and time-consuming, the new method is said to offer speed, economy, and thorough cleaning by blasting without damage to the molds. One trouble with the conventional acetylene torch-wire brush combination method is said to lie in the fact that it is impossible for the wire brushes to reach the corners of intricate tread designs. The burning and brushing is also reported to often play havoc with mold surfaces. All of these difficulties, it is claimed, are eliminated with the new mold cleaning method.

The new method features a soft-grit blasting material used in specially-designed blasting equipment for production line mold cleaning. A revolutionary feature is that molds may be cleaned in or out of the presses. Molds may be cleaned in individual heater jackets without disrupting operations for a time greater than that actually required for cleaning. The soft-grit blasting material is sold by The C. P. Hall Co. under the name of "Shelblast" and is manufactured by Agicide Laboratories.

Shelblast is a soft blast material made of lignocellulose pellets that utilize the tremendous pressure of compressed air blasting to thoroughly clean and polish molds rapidly and economically. It is non-abrasive, does not etch metal surfaces having a Brinell hardness of 200 or greater, and is particularly effective in polishing chrome plating. In addition to the cleaning and polishing qualities of Shelblast, a thin wax coating, which inhibits rusting of ferrous metals, is spread over the mold surfaces. This coating eliminates the necessity for other protective coatings, except when molds are put into storage for long periods.

Shelblast pellets do not shatter but wear down gradually. They are automatically recycled through the blasting equipment and are recirculated 100 times or more before being exhausted as dust. The actual loss from use is 1% or less per cycle of blasting, or about 6 lbs. per hour at pressures of 100 lbs. p.s.i. The pellets scour remote and inaccessible corners which cannot be reached by conventional cleaning methods. Shelblasted mold surfaces require cleaning less frequently. By the new method, production is increased substantially since more rubber articles per mold can be cured between cleaning intervals. Initial cures after cleaning are satisfactory. No "breaking in" is needed.

The Vacu-Blast Company has developed equipment for the efficient use of Shelblast in cleaning tire and mechanical goods molds. The Vacu-Blaster uses a revolutionary system of continuously recirculating grit to provide dustless blasting for cleaning molds in the presses. The nozzle is surrounded by a vacuum pick-up cone which eliminates dust and flying particles. The same equipment is used with a blast cabinet for cleaning and recirculating the grit when blasting pot heater molds and mechanical goods molds. A cabinet designed to fit the job is substituted in this case for the vacuum pickup nozzle. There is no industrial hazard of any kind in this method of cleaning.

Here is demonstrated the Shelblasting operation on a tire mold, which is inside the Vacu-Blast cabinet.

Of interest to the rubber manufacturer is the claimed economy involved through the use of soft-grit blasting. Present cleaning costs are said to range from $1.00 to $3.00 per tire mold. The new method is reported to clean as many as six pot heater tire molds per hour with costs as low as 33c per mold. Savings up to $25,000.00 per year are said to be possible in plants cleaning fifty tire molds per day.

Shelblast is available to the rubber industry through The C. P. Hall Company, Akron, Ohio, with stocks in various sections of the country. Further information concerning the Vacu-Blaster may be obtained from the Vacu-Blast Company, 1054 Broadway, Burlingame, Calif.

In this demonstration of the portability of the Shelblast equipment, a tire mold outside the cabinet is being cleaned.

NBS Consolidates Two Divisions

The Commercial Standards Division and the Simplified Practice Division of the National Bureau of Standards, Washington 25, D. C., have been consolidated into a single division, called the Commodity Standards Division. The new division will continue the Bureau's coordinating role in the development of voluntary simplified practice recommendations and commercial standards with industrial and technical groups. In addition, the division will be responsible for coordinating Bureau work for the Federal Specifications Board. Edwin W. Ely, formerly chief of the Simplified Practice Division, has been appointed chief of the new division, with F. W. Reynolds, formerly acting chief of the Commercial Standards Division, as assistant chief.

A.S.T.M. Issues 1946 Standards

The American Society for Testing Materials, 1916 Race St., Philadelphia 3, Penna., has issued its 1946 Book of A.S.T.M. Standards. The latest edition, with more than 1400 standards, specifications, tests and definitions, and containing almost 7,000 pages, has been issued in five parts instead of the former three volumes, as follows: Part IA, Ferrous Metals; Part IB, Non-Ferrous Metals; Part II, Nonmetallic Materials — Constructional; Part IIIA, Nonmetallic Materials—Coal and Coke, Petroleum Products, Aromatic Hydrocarbons, Soaps, Waters, Textiles, Gaseous Fuels; Part IIIB, Nonmetallic Materials—Electrical Insulating Materials, Plastics, Rubber, Paper, Shipping Containers, Adhesives. In cloth binding, Parts IA, IB, IIIA or IIIB are $8.00 each; Part II is $12.00; and a complete set of all five parts is $44.00. Copies may be obtained direct from the Society.

Report on Engine Vibration

A report dealing with the measurement of torsional vibration of engines has been made available by the Society of Automotive Engineers, 29 West 39th St., New York 18, N. Y. Entitled "Cooperative Testing of Torsiographs and Calibrators," the report covers a program of cooperative testing undertaken by a special committee of the S. A. E. and the U. S. Navy Bureau of Ships. The tests were conducted and the results are presented in such a manner as to provide direct comparisons of the results obtained with the various calibrators and torsiographs used. The report is priced at $3 for S. A. E. members and $6 for non-members.

Terilon Molding Compound

A new rubber-like molding compound, which is reported to be impervious to water, acids, alkalies, and temperatures up to 300° F., has been developed by Parrott Plastics, 666 South Front St., Elizabeth 2, N. J. Called Terilon, it is said to maintain very close tolerances and critical dimensions in reproducing models having extreme undercuts, since it can be stretched without any loss in its elasticity. Available in liquid form, the material is stable at room temperature and requires no special precautions for storage. The material may be brushed on or poured directly over the model, depending upon the nature of the work.

Cabot Seminar Hears Parkinson

Dr. D. Parkinson, chief tire compounder of the Dunlop Rubber Co., Ltd., Birmingham, England, was the principal speaker at one of the regular seminars of Godfrey L. Cabot, Inc., held recently in the Cabot laboratory in Boston, Mass. Dr. Parkinson presented a paper covering recent research work performed on carbon blacks in rubber at Fort Dunlop, England.

Heads Philback Laboratory

Lynn Harbison

Frank Andrews, Manager, Carbon Black Division, Chemical Products Department of Phillips Petroleum Company, has announced the appointment of Lynn Harbison as Manager of the company's Philblack Sales Service Laboratory at Akron, Ohio. Mr. Harbison brings to this laboratory twenty-one years of broad experience in the rubber industry. Following his work in the Mechanical Goods Division of the B. F. Goodrich Company he spent two years in Europe modernizing a rubber plant and further supplemented his experience in this field by work in the Mechanical Goods Division of the U. S. Rubber Company, at Passaic, New Jersey. For the past five years, he has been employed as a development chemist in the tire division of the Firestone Tire and Rubber Company. Mr. Harbison graduated with honors from the University of Missouri where he obtained both Bachelor of Science and Chemical Engineering degrees.

Coatings Department Created

A new Flexible Plastic Coatings Department has been organized by the Interchemical Corp. as part of its Finishes Division, with Chester M. Robbins, formerly vice-president of the company's Textile Colors Division, as sales manager. The new department, with sales headquarters at 57 State St., Newark 2, N. J., will specialize in the coating and decoration of such sub-strata as rubber, plastics, textiles, paper, leather, and metal foils, and will handle compounds for continuous film coatings, flocking compositions and adhesives, and gravure ink of the solvent type for application on textile print machines.

Geon Polyblend 500 X 503

A new thermoplastic material, which is the first in a series of colloidal blends of Geon polyvinyl chloride resin and Hycar nitrile rubber polymers, has been developed by the B. F. Goodrich Chemical Co., 324 Rose Building, Cleveland 15, Ohio. Designated as Geon Polyblend 500 x 503, the material has been especially designed for extruding and calendering, and is said to be unusually well adapted to embossing and press polishing operations. According to the company, the polyblend combines the toughness and chemical resistance of polyvinyl chloride with the solvent resistance and flexibility of nitrile rubber. It is also reported to be unique in that the valuable characteristics of vinyl elastomers are achieved with no liquid plasticizer. The nitrile component of the polyblend serves as a non-extractable, non-migrating, polymeric plasticizer.

Paraplex RG-10 Plasticizer

Resinous Products & Chemical Co., 222 West Washington Square, Philadelphia 5, Penna., has developed a new polymeric plasticizing resin which is intended for use with nitrocellulose, urea, and melamine resins. Designated as Paraplex RG-10, the new plasticizer possesses light color, and is claimed to have improved alcohol tolerance, greater solvency for nitrocellulose, unusual pigment stability, and increased adhesion to vulcanized rubber. It resists ultra-violet light and does not spew at temperatures as high as 325° F. Due to its color, durability, and flexibility, the plasticizer is recommended in high quality nitrocellulose coated fabrics, in white lacquer for use on rubber articles, and in tough, oil-resistant cable coverings.

Naugatuck BLE 25 Antioxidant

A new low viscosity antioxidant for rubber compounding has been developed by the Naugatuck Chemical Division of the U. S. Rubber Co., 1230 Avenue of the Americas, New York 20, N. Y. The new antioxidant, known as BLE 25, is said to protect rubber products equally as well or better than the company's regular BLE. BLE 25 has a viscosity of 20 to 50 poises, while the viscosity of BLE is 250 to 500 poises. According to the company, BLE 25 flows like water with a minimum of warming, is easy to drain from drums, and easy to add to mill or Banbury batches.

Hercules Powder Reduces Prices

A sweeping reduction, ranging from 10 to 25%, in the prices of major volume synthetic resins has been announced by the Hercules Powder Co., Wilmington, Del. Staybelite esters, for example, were reduced 25%. A major factor affecting the reductions was said to be the company's new, modern synthetic resin plant at Burlington, N. J., which is now in full operation.

COOPERATIVE RESEARCH EXPANDS PAN-AMERICAN RUBBER INDUSTRY

The joint efforts of the United States and Latin American countries to produce natural rubber during the war have set the stage for a major post-war industry in the tropical regions of the Western Hemisphere, according to a statement made recently by Dr. E. W. Brandes, who is in charge of rubber investigations for the U. S. Department of Agriculture.

Dr. Brandes pointed out that the cooperative natural rubber program has emerged from the nursery stage in Brazil, Columbia, Costa Rica, Guatemala, Haiti, Honduras, Mexico, and Peru. Approximately 29,000 acres of field plantings are now established in government demonstration areas, on coffee, banana, and other plantations, and on nearly a thousand small farms.

The cooperating governments are establishing central nurseries and modifying and coordinating their farm credit, colonization, and extension programs to meet the requirements of the long-term crop. The U. S. Department of Agriculture maintains scientists and technicians in various centers to conduct research and to train local workers.

The return of rubber as an economic crop in Latin America was made possible by the introduction of clones from high yielding Hevea trees from the Far East and by development of measures to control the destructive leaf blight. USDA pathologists have carried on a breeding program for several years and it is still in progress to develop resistant varieties of Hevea.

The technique they worked out for transplanting buds from resistant trees to the upper trunks of diseased trees has made it possible to start up orchards in areas formerly abandoned. Their development of a spray for controlling blight in seedling nurseries forged the remaining link in the chain of control of leaf blight.

Dr. Brandes said rubber plantings of 5 to 10 acres offer a profitable long-term enterprise to the small farmer in Latin America and will help build a diversified and permanent agriculture in the tropics. During the first three years, food crops such as corn, rice, beans, and manioca can be grown in the 20-foot spaces between tree rows. After the tenth year, the farmer is assured a yield of from 1,000 to 1,600 pounds per acre annually from bud-grafted resistant Hevea strains.

Bulletin on Geon Polyblends

A technical bulletin on the Geon 500 Series Polyblends, the company's colloidal blends of polyvinyl resins and nitrile rubber polymers, has been made available by the B. F. Goodrich Chemical Co., Rose Building, Cleveland 15, Ohio. Physical test data on a typical Geon polyblend compound for black press-polished sheetings is covered in the bulletin.

An FAO Prediction

The United Nations Food and Agriculture Organization predicted in a report issued on August 1 that the price of natural rubber would decline to 12½ cents a pound, continuing the downward trend from the 25¾-cent level in the third quarter of 1946. The report pointed out that the entry of large-scale Netherlands East Indies production into the world rubber market would materially affect current supply and demand developments.

Develops Good-rite Resin 50

A new high styrene-low butadiene copolymer has been developed by the B. F. Goodrich Chemical Co., 324 Rose Building, Cleveland 15, Ohio, for use as a stiffening agent in the manufacture of synthetic shoe soling. The company claims that the material is also well adapted to such applications as electrical insulation, protective coatings, and for molded items such as injection molded appliance plugs. Called Good-rite Resin 50, the resin is marketed as a white powder. It has a specific gravity of 1.045 and may be softened and sheeted on a mill at temperatures ranging from 150° to 225° F., or injection molded at temperatures ranging from 380° to 440° F., using a 45-second molding cycle. Unusual impact resistance, excellent resistance to water absorption, increased hardness, and good electrical properties are some of the characteristics that this new resin is said to impart to natural and synthetic rubbers.

To Address Faraday Society

Drs. Frank R. Mayo and Cheves T. Walling, of the General Laboratories of the U. S. Rubber Co., at Passaic, N. J., have been invited to address European scientists at a meeting of the Faraday Society, to be held at Oxford, England, from September 23 to 25. The purpose of the meeting, which is the first in the field since before World War II, is to exchange information on "free radical chemistry." Drs. Mayo and Walling will present three papers on basic synthetic rubber research at the meeting.

DuPont BAC Latex

An interpolymer latex having a 40% dry solids content has been developed by the Rubber Chemicals Division of E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del., specifically to act as a carrier for the resorcinol-formaldehyde type bonding agent. Known as BAC Latex, the latex is said to be especially useful for bonding nylon fibers to neoprene.

PRODUCTION OF CARBON BLACK ESTABLISHES RECORD IN 1946

Carbon black production and sales were in record volume in 1946, responding to larger demand from all classes of domestic consumers and export, according to the Bureau of Mines of the U. S. Department of the Interior. Production of 1,244,421,000 pounds exceeded the 1945 record by 18%, while sales expanded 24% over 1945 to 1,269,740,000 pounds. Sales to rubber companies increased from 804,386,000 pounds in 1945 to 941,464,000 pounds in 1946 and record quantities of black were taken by the ink and paint industries.

Producers' stocks of black declined to 76,228,000 pounds on December 31, 1946, as compared with 102,005,000 pounds at the end of 1945. Stocks of contact (channel) type blacks declined throughout the year. Furnace type stocks were built up moderately in the second and third quarters but declined in the fourth quarter.

Furnace black production gained 22% over 1945 to 625,312,000 pounds and was greater for the first time than that of contact type blacks—619,109,000 pounds. Although output of the Texas Panhandle district increased to a new high of 596,678,000 pounds of black of all types, its share of the United States total declined to 48% as compared with 51% in 1945 and 70% in 1941.

As the quantity of natural gas consumed in carbon black manufacture increased only 11% in 1946 to 478,349,000 cubic feet, the average yield increased from 2.32 pounds of black per thousand cubic feet of gas used in 1945 to 2.44 pounds in 1946. The average value at the plants of gas used was 3.02 cents per thousand cubic feet in 1946 and 2.28 cents in 1945.

Although exports of contact types were controlled, exports of all grades increased 56% to the unprecedented total of 271,085,000 pounds. The average value of carbon black at the plants increased from 4.02 cents a pound in 1945 to 4.82 cents in 1946 as prices of the principal contact grades advanced. A total of sixty plants operated in 1946, a net gain of one over 1945. One channel plant in Texas did not produce and two new furnace plants in Texas and Kansas were put in production.

Issue New Automotive Data

The Automobile Manufacturers Association, New Center Building, Detroit 2, Mich., has issued the 1946-47 edition of "Automobile Facts and Figures." According to the new edition, the 27th to be issued, one-sixth of all business concerns in the United States are automotive, based on production, sales service and use of motor vehicles. Some 537,000 automotive business places employ 8,200,000 persons, or one in every seven workers in the nation. Copies of the new edition can be secured without cost on direct request.

CURRENT NEWS OF THE MONTH

MODIFICATION OF PATENT POOL IS SOUGHT BY MANUFACTURERS

Under the terms of the synthetic rubber patent pool signed in December of 1941 any new developments in copolymers containing 15% or more of butadiene achieved by any signer of the pact automatically must be made known to the government and made available to the other members of the pool. The pact also provides for the free exchange of improved know-how in manufacturing processes.

Signers of the original patent pool include Goodyear, Goodrich, U. S. Rubber and Firestone, as well as the Standard Oil Co. of New Jersey and the Hydrocarbon Chemical Co., an affiliate of the Phillips Petroleum Co., which has since retired from the commercial production of synthetic rubber, turning its activities in this direction over to the B. F. Goodrich Chemical Co.

The wartime cooperation of the rubber and oil companies involved in the patent pool has been remarkable, and the terms of the pact have been faithfully followed. In the present period, however, practically all of these companies are reluctant to pour their full resources into the development of new and better polymers so long as they are pledged to pool their information on research and production. Because of this situation, an attempt was made some time ago by the participants to have the original agreement terminated.

New Attempt Is Made

Within recent weeks another attempt has been made, this time in the form of a modification of the pact. It is understood that a proposal having the unanimous support of all of the companies involved has been submitted to the Office of Rubber Reserve. Although the terms of the proposed modification are confidential it is believed that it has a two-fold aim: (1) To assure the government that it will continue to benefit from any discoveries that can be put to use in the period of Federal ownership of the synthetic rubber plants, and (2) To assure the companies that they can pursue long-range projects at their own expense, keep such projects secret, and put them to use after the government retires from the synthetic rubber business.

Rubber Reserve officials have expressed puzzlement as to how long-range projects can be separated from immediate projects. They admit, however, that the present arrangement may retard research and development, and sympathize with the objectives of the companies. One major aim of Rubber Reserve is to make certain that the government will not be deprived of any developments which may enable it to produce lower cost or improved polymers in any interim period between government and private operation of the plants.

The government is anxious to dispose of its synthetic rubber plants, either by sale or lease, and turn operation over to private industry. Prospective purchasers, however, are not eager to make any definite bids until Congress decides what support the industry will receive after present controls expire. Such support is expected to be incorporated in the permanent rubber legislation now being planned for presentation to Congress after the turn of the year.

Prospective purchasers of government producing facilities naturally want assurance that they can operate such facilities without fear of infringing on any old patents. According to Rubber Reserve, the terms of the original patent pool cover that contingency, and officials of the government agency insist that such protection must be carried over into any modification which might be made. They point out that if the pool was simply terminated, it would open up the question of royalties, which would increase the cost of producing synthetic rubber.

Realizing that the job of framing permanent rubber legislation and disposing of the synthetic rubber plants will be more complicated unless the patent structure is solved beforehand, Rubber Reserve officials are known to be anxious to reach a settlement with the industry within the next few months.

Drop Premium Price

The Office of Rubber Reserve (RFC) has advised that there is no longer a premium price on black masterbatches made at the Institute, West Virginia, plant by the U. S. Rubber Co. Examples of this premium price are X-369, X-374, and X-378, which were indicated as premium priced polymers when originally published in this journal.

U. S. Wire Moves Plant

U. S. Wire & Cable Corp., whose plant at 334 Mulberry St., Newark, N. J., was recently damaged by fire, has moved its manufacturing facilities to new quarters in the rear of 27 Haynes St., Newark. Armand Sequeira is now president of the company, which manufactures both bare and insulated wire.

NEW LABOR PROBLEMS LOOMING AS UNION SEEKS WAGE INCREASE

New labor problems are looming on the rubber horizon as the United Rubber Workers of America (CIO) continues its activities to reopen the wage question and secure additional increases. At this writing it seems evident that bargaining on a Big Four basis has come to an end. Wage negotiations under this arrangement were accomplished early in 1946, when the workers were granted an 18½ cent hourly increase, and last March, when an 11½ cent an hour increase was approved.

Although the rubber union requested that the current negotiations, opened up under the terms of the last agreement, be continued on the same Big Four basis, Goodrich and Firestone have agreed to reopen the wage question on an individual plant basis, while Goodyear is prepared to discuss it on a company-wide scale. It is believed that U. S. Rubber will also consent to such discussion.

In an effort to force Goodrich to negotiate on a company-wide basis, seven locals of the rubber union approved a national strike against the company on August 9. Company contracts with these unions expire between August 14 and 18. The strike was scheduled to start on August 14 but on August 12 some 800 workers failed to report for work at the company's plant at Tuscaloosa, Alabama.

Negotiation Is Sole Issue

The sole issue behind the Goodrich strike, which is expected to interfere with operations at the Akron, Oaks, Clarksville, Cadillac, Miami, and Los Angeles plants, as well as the Tuscaloosa plant, is that of negotiating on a company-wide basis. The union leaders are pledged not to attempt to conclude separate agreements with the company covering their respective plants.

The agreement concluded at Cleveland, Ohio, last March, secured an 11½ cent an hour increase for the workers. Under its terms both sides, as of July 22, were permitted to reopen wage talks, and the union took advantage of this option.

In accepting the 11½ cent increase, last March, according to the union, the rubber workers accepted 3½ cents less than the "national pattern" of 15 cents set in other fields. Because of increases in the cost of living since the Cleveland meeting, union officials state, the rubber workers are entitled to more than just a 3½ cent increase now.

(EDITOR'S NOTE: The national strike against Goodrich was averted on August 13 because of a last-minute decision by the company to negotiate on a company-wide basis.)

LATEST HIGH POLYMER FORUM FEATURES TWENTY-THREE PAPERS

The High Polymer Forum, which has become an accepted feature of the meetings of the American Chemical Society, will again be held at the 112th National Meeting of the Society, to be held in New York City the week of September 15th.

The latest Forum, under the auspices of the Division of Cellulose Chemistry, will be held in the Ballroom of the Hotel New Yorker on Monday and Tuesday, September 15 and 16. Sessions will be held in the mornings and afternoons of both days.

Twenty-three papers will be presented as follows, the author or authors being shown in parentheses:

Mass Spectrometric Investigation of the Thermal Decomposition of Polymers (L. A. Wall)

Pyrolytic Fractionation of Polystyrene in a High Vacuum and Mass Spectrometer Analysis of Some of the Fractions (S. L. Madorsky and S. Straus)

Viscosity Changes in Chloroprene Emulsion Polymerization (G. W. Scott and H. W. Walker)

Isomerism in Vinyl Polymers (S. T. Gross, C. E. Schildknecht and A. O. Zoss)

Polymer Plasticizer Interaction (E. K. Rideal)

Di-radical Initiation. Phthalyl Peroxide as a Polymerization Initiator (H. A. Shah, F. Leonard and A. V. Tobolsky)

Cumene Hydroperoxide in a Redox Emulsion Polymerization System (E. J. Vandenberg and G. E. Hulse)

The Emulsion Copolymerization of Methyl Isopropenyl Ketone with Butadiene (Charles W. Gould and G. E. Hulse)

Properties of Vulcanizates of Methyl Isopropenyl Ketone—Butadiene Copolymers (Charles W. Gould, Lyle O. Amberg and G. E. Hulse)

Use of Pure Resin Acid Soaps in GR-S Polymerization (Julian L. Azorlosa)

The Occurrence of Head-to-Head Arrangements of the Structural Units in Polyvinyl Alcohol and Acetate (Paul J. Flory and Fred S. Leutner)

Birefringence as a Function of Identity Period in High Polymers (R. J. Reid, G. P. Rowland and W. G. Mayes)

Dependence of Elastic Properties of Vulcanized Rubber on the Degree of Cross Linking (Paul J. Flory, Norman Rabjohn and Marcia C. Schaffer)

Thermodynamics of Crystallization in High Polymers. IV. Melting Point Relationships (Paul J. Flory)

Thermodynamics of Crystallization in High Polymers. V. Dependence of Melting Points of Polyesters and Polyamides on Molecular Weight and Composition (Harold R. Mighton, Robert D. Evans, and Paul J. Flory)

Measurements of Stress Relaxation in High Polymer Materials (W. S. MacDonald and Alexis Ushakoff)

Properties of Starch Pastes and Solutions and Their Molecular Interpretation (Kurt H. Meyer)

Calculations of the Deviation of Polymer Solutions from Raoult's Law (Bruno H. Zim)

Average Length and Radius of Normal Paraffin Hydrocarbon Molecules (William J. Taylor)

Synthesis of Multichain Polymers and Investigation of Their Viscosities (John R. Schaefgen and Paul J. Flory)

Ultrasonic Determination of Molecular Weight, Compressibility, and Ratio of Specific Heats for Some Silicone Fluids (Alfred Weissler)

Statistical Thermodynamics of the Sorption of Water Vapor by High Polymers (Malcolm Dole)

Continuous Filament Casein Yarn Produced by Pot Spinning (Robert F. Peterson, Robert L. McDowell and Sam R. Hoover)

Coming Events

Sept. 12. Chicago Rubber Group, Hotel Morrison, Chicago, Ill.
Sept. 17-19. Rubber Division, A.C.S., Fall Meeting, Hotel Commodore, New York City.
Sept. 27. Philadelphia Rubber Group, Philadelphia, Penna.
Sept. 27. Connecticut Rubber Group, Outing, Eichner's Grove, Trumbull, Conn.
Oct. 3. Boston Rubber Group, Hotel Somerset, Boston.
Oct. 7. Los Angeles Rubber Group, Mayfair Hotel, Los Angeles, Calif.
Oct. 9. Southern Ohio Rubber Group, Outing, Gem City Club, Dayton, Ohio.
Oct. 24. New York Rubber Group, Hotel McAlpin, New York, N. Y.
Oct. 31. Chicago Rubber Group, Hotel Morrison, Chicago, Ill.
Dec. 5. Philadelphia Rubber Group, Philadelphia, Penna.
Dec. 12. New York Rubber Group, Xmas Party, Hotel McAlpin, New York, N. Y.
Dec. 12. Boston Rubber Group, Xmas Party, Hotel Somerset, Boston.
Dec. 18. Southern Ohio Rubber Group, Dayton, Ohio.
Dec. 19. Chicago Rubber Group, Xmas Party, Hotel Morrison, Chicago, Ill.

Griptex Compound for Rugs

A new liquid rubber-plastic compound, which is reported to make rugs sprout-proof, fray-proof, and skid-proof, has been introduced by the Adhesive Products Corp., 1662 Boone Ave., New York 60, N. Y. Designated as Griptex, the compound can be easily applied to the back of rugs by brush, spray-gun roller, or doctor blade. It is said to form a strong, flexible film which anchors each individual tuft and stops the pile from pulling out. The company claims that the compound is waterproof.

"WORLD SCANDAL" CHARGED TO BRAZILIAN RUBBER ACTIVITY

According to a dispatch from a correspondent in La Paz, Bolivia, published in a recent issue of the London, England, *News-Chronicle*, some 31,000 men seeking rubber during the war died in the South American jungles of disease, wild animals and Indian attacks. The newspaper called it "A world scandal."

Correspondent Peter Grieve reported that in a 3,000 mile trip through the Amazon country he pieced together the death trek of 53,000 men.

A handful reached safety, others died en route and 22,000 remained trapped in the jungles, he said. The wives and relatives of the missing men are clamoring to learn from the Brazilian Government what has become of the men, according to Grieve.

"Responsible Brazilians and foreign business men know these things well, for they have been spectators, and they are confirmed by U. S. missionaries," he said. "But while the Brazilian Government and rubber bank wrangle about responsibility for this sorry state, there is no official answer to the question—where are these men?"

Grieve said Brazil agreed to transport men from the Atlantic coast of Brazil to seek raw rubber under a U. S.-Brazilian agreement in which U. S. capital supported the rubber bank. Brazil was to provide food, medicine and clothing.

He quoted one man's description of the trip into the jungle. The men said guards whipped and killed men, fed them concentration camp diet and forced them to work in fever-ridden swamps. Meanwhile, he said, food and medical supplies for them were sold in the black market.

The informant said troops fired on the marchers with machine guns to halt revolts. Many died of yellow fever, malaria, and malnutrition, the dispatch asserted.

Rubber Consumption in May

Consumption of rubber by American manufacturers in May, 1947, amounted to 91,761 long tons, a decrease of 6.51% from the 98,151 tons consumed during the preceding month, according to the Rubber Manufacturers Association. Of the total amount of rubber consumed in May, 43,098 tons were natural rubber and 48,663 tons were synthetic. Consumption for the first five months of 1947 totaled 486,926 tons, including 216,331 tons of natural rubber and 270,595 of synthetic, as compared with 414,653 tons consumed during the corresponding period of the preceding year, an increase of 17.34%. A total of 21,697 tons of reclaimed rubber was consumed in May, which is a decrease of 13.44% from the 25,066 tons consumed during the previous month.

REVEAL DETAILS OF ARMY-NAVY PROPOSED PERMANENT RUBBER LEGISLATION

As reported in our previous issue, the Army-Navy Munitions Board recently submitted proposed permanent legislation to the House Armed Services Subcommittee, headed by Rep. Paul W. Shafer. At the time Rep. Shafer stated that the proposed legislation was completely biased and did not represent the viewpoint of the rubber manufacturing industry. He declined, however, to reveal the contents of the proposed bill because "revelation would prompt sniping by the industry." Specific content of the bill proposed by the Munitions Board has now been revealed.

Six specific measures are proposed in the bill as follows:

1. Establishment of a Rubber Council, consisting of the Secretary of Commerce as chairman and the Secretaries of the State, War and Navy Departments, the function of which would be to make general policy decisions.

2. Creation of a National Rubber Administration headed by a $12,500 a year administrator, functioning under the Department of Commerce, to carry out the program specified by the Rubber Council.

3. A mandatory requirement that one-third of the estimated total new general purpose rubber usage be general purpose synthetic rubber. (This, it is estimated, would ensure a market for approximately 300,000 long tons of general purpose synthetic annually.)

4. Retention of synthetic rubber plant capacity of 600,000 long tons annually, either in operation or stand-by condition.

5. Sale of government-owned synthetic rubber plants to private industry quickly, the sales to be handled in such manner as to prevent a monopoly but to ensure operation of about 300,000 tons annually.

6. Maintenance of plants for which there is no sale up to the 600,000-ton-a-year capacity in stand-by condition in such manner as the Rubber Council may stipulate.

The proposed Munitions Board's bill also specifies that the tire manufacturing industry would not be required to absorb more than 85% of the general purpose synthetic rubber annually. Of the total amount of rubber consumed annually by manufacturers of inner tubes, at least 4% would have to be special synthetic rubber. Mandatory usage orders would be issued by the Rubber Council.

Industry Terms Bill Unacceptable

It has also been learned that the bill proposed by the Army-Navy Munitions Board was the subject of discussion at a meeting of the Board's Rubber Industry Advisory Committee held in New York City on June 17. As a result of that meeting, John L. Collyer, president of the B. F. Goodrich Co., who presided as chairman, advised the Munitions Board that it was the unanimous opinion of the Committee that the proposed bill was not acceptable. Establishment of a National Rubber Administration was compared to the now defunct National Recovery Administration which was declared unconstitutional by the Supreme Court. It was stressed that any legistation with respect to the use of rubber should be simple and self-operating.

Reflecting the viewpoints of the committee members, Mr. Collyer pointed out that the proposed bill placed rubber manufacturers under bureaucratic control without time limit since it was indefinite in duration. Rather than the formulation of an endless program, one which could be terminated only by Congress or the Courts, it was pointed out that what is actually needed is an interim program covering general purpose synthetic rubber with a definite termination date. It was said that the formulation of long term legislation can only be based on factors which cannot be determined until both natural and synthetic rubber have been in competition for a reasonable period of time.

Holding that the government has now fully depreciated its investment in the synthetic rubber plants, the industry group also urged that the price of general purpose synthetic rubber be reduced 2¾ cents a pound, the amount said to cover amortization charges.

Subsidy Plans Rejected

In connection with the disclosure of the contents of the proposed Army-Navy Munitions Board's bill, it was also revealed that the Board had given serious consideration to various subsidy plans submitted to it. Richard Deupree, chairman of the Munitions Board, stated that the Board had completely rejected any subsidy plan designed to support the synthetic rubber industry.

It was indicated that any subsidy plan adopted would cost the government approximately $85,000,000 a year. One plan proposed covered both synthetic rubber and reclaimed rubber. Under this plan a subsidy of 9½ cents a pound for synthetic rubber would be provided, the cost of GR-S to the consumer being 9 cents a pound, while a subsidy of 3c a pound would be provided for reclaimed rubber. On the basis of 300,000 long tons of synthetic rubber and 250,000 long tons of reclaimed rubber, the subsidy would amount to $68,000,000 and $17,000,000, respectively, or the total of $85,000,000 mentioned.

A special report accompanying the Munitions Board's proposed legislation discussed three suggested subsidy plans, one on the consumer level, another at the producer level, and the third entailing government purchase and resale.

Under the consumer level plan, consumers would be paid a subsidy which would be the difference between the average price f.o.b. synthetic rubber producer's plant and the price established by schedules formulated by the Rubber Council.

If the producer subsidy were to be adopted, producers would be paid subsidies so that the price to consumers is sufficiently under the price of imported natural rubber in order to guarantee that the prescribed minimum quantities would be used each year.

The third subsidy plan involves government purchases of the necessary quantities of synthetic at whatever prices it may need to pay in order to get sufficient quantities, and government resale at whatever prices it could get on the open market. Since the government selling price would be less than its buying price, a loss would be sustained. This loss would be met by Federal appropriations.

No Legislation This Year

As previously reported, Rep. Shafer, in his capacity as Chairman of the House Armed Services Subcommittee, has severely criticized the legislation proposed by the Munitions Board, claiming that it contains regulations "which the industry could not live with." According to Mr. Shafer, the legislation closely follows the recommendations made by the now defunct Inter-Agency Rubber Policy Committee. Mr. Shafer is on record that any permanent rubber legislation should involve the barest minimum of government control.

Because the Munitions Board's bill is at such variance with the expressed recommendations of the rubber manufacturing industry, the House Subcommittee did not feel it timely to submit any bill to the 80th Congress. Mr. Shafer has expressed confidence, however, that the Committee will be able to present to Congress next January a workable, efficient bill which will be satisfactory to both government and industry alike. In the interim period, the Subcommittee will hold a series of public hearings some time this Fall.

ORR Assigns GR-S Numbers

Several experimental GR-S polymers have been assigned to the GR-S numbered series by the Office of Rubber Reserve, Reconstruction Finance Corporation. The new designations, with the former experimental designation in parentheses, are as follows: GR-S-21 (X-250 GR-S); GR-S-18 (X-382 GR-S); GR-S-45AC (X-317AC GR-S); GR-S-Black-20 (X-369 GR-S); GR-S-SP (Standard Naugatuck GR-S); GR-S-65 (Naugatuck GR-S-65). GR-S-10AC and X-366 GR-S are now interchangeable, as are GR-S-10 and X-368 GR-S.

Akron Chemical Completes Building

The Akron Chemical Co., distributors of Calco accelerators, Huber blacks, and other products to the rubber and allied industries, recently completed a new building at 255 Fountain Street in Akron, Ohio. All activities are now centered in the new building, including general offices, laboratory, warehousing and shipping. J. R. Silver, Jr., president of the company, has announced that Harold M. Whitacre has been named vice-president of the company, and that Richard L. Silver has joined the technical sales staff.

NEW MOLD CLEANING METHOD OFFERED TO RUBBER MANUFACTURERS

A new method of cleaning tire and mechanical goods molds was demonstrated in Akron, Ohio, recently. This method, developed jointly by Agicide Laboratories, Inc., of Los Angeles, and the Vacu-Blast Co., of Burlingame, Calif., was demonstrated under the sponsorship of The C. P. Hall Co. of Akron, Ohio.

Whereas conventional methods for cleaning tire molds are often costly, hazardous and time-consuming, the new method is said to offer speed, economy, and thorough cleaning by blasting without damage to the molds. One trouble with the conventional acetylene torch-wire brush combination method is said to lie in the fact that it is impossible for the wire brushes to reach the corners of intricate tread designs. The burning and brushing is also reported to often play havoc with mold surfaces. All of these difficulties, it is claimed, are eliminated with the new mold cleaning method.

The new method features a soft-grit blasting material used in specially-designed blasting equipment for production line mold cleaning. A revolutionary feature is that molds may be cleaned in or out of the presses. Molds may be cleaned in individual heater jackets without disrupting operations for a time greater than that actually required for cleaning. The soft-grit blasting material is sold by The C. P. Hall Co. under the name of "Shelblast" and is manufactured by Agicide Laboratories.

Shelblast is a soft blast material made of lignocellulose pellets that utilize the tremendous pressure of compressed air blasting to thoroughly clean and polish molds rapidly and economically. It is non-abrasive, does not etch metal surfaces having a Brinell hardness of 200 or greater, and is particularly effective in polishing chrome plating. In addition to the cleaning and polishing qualities of Shelblast, a thin wax coating, which inhibits rusting of ferrous metals, is spread over the mold surfaces. This coating eliminates the necessity for other protective coatings, except when molds are put into storage for long periods.

Shelblast pellets do not shatter but wear down gradually. They are automatically recycled through the blasting equipment and are recirculated 100 times or more before being exhausted as dust. The actual loss from use is 1% or less per cycle of blasting, or about 6 lbs. per hour at pressures of 100 lbs. p.s.i. The pellets scour remote and inaccessible corners which cannot be reached by conventional cleaning methods. Shelblasted mold surfaces require cleaning less frequently. By the new method, production is increased substantially since more rubber articles per mold can be cured between cleaning intervals. Initial cures after cleaning are satisfactory. No "breaking in" is needed.

The Vacu-Blast Company has developed equipment for the efficient use of Shelblast in cleaning tire and mechanical goods molds. The Vacu-Blaster uses a revolutionary system of continuously recirculating grit to provide dustless blasting for cleaning molds in the presses. The nozzle is surrounded by a vacuum pick-up cone which eliminates dust and flying particles. The same equipment is used with a blast cabinet for cleaning and recirculating the grit when blasting pot heater molds and mechanical goods molds. A cabinet designed to fit the job is substituted in this case for the vacuum pickup nozzle. There is no industrial hazard of any kind in this method of cleaning.

Here is demonstrated the Shelblasting operation on a tire mold, which is inside the Vacu-Blast cabinet.

Of interest to the rubber manufacturer is the claimed economy involved through the use of soft-grit blasting. Present cleaning costs are said to range from $1.00 to $3.00 per tire mold. The new method is reported to clean as many as six pot heater tire molds per hour with costs as low as 33c per mold. Savings up to $25,000.00 per year are said to be possible in plants cleaning fifty tire molds per day.

Shelblast is available to the rubber industry through The C. P. Hall Company, Akron, Ohio, with stocks in various sections of the country. Further information concerning the Vacu-Blaster may be obtained from the Vacu-Blast Company, 1054 Broadway, Burlingame, Calif.

In this demonstration of the portability of the Shelblast equipment, a tire mold outside the cabinet is being cleaned.

NBS Consolidates Two Divisions

The Commercial Standards Division and the Simplified Practice Division of the National Bureau of Standards, Washington 25, D. C., have been consolidated into a single division, called the Commodity Standards Division. The new division will continue the Bureau's coordinating role in the development of voluntary simplified practice recommendations and commercial standards with industrial and technical groups. In addition, the division will be responsible for coordinating Bureau work for the Federal Specifications Board. Edwin W. Ely, formerly chief of the Simplified Practice Division, has been appointed chief of the new division, with F. W. Reynolds, formerly acting chief of the Commercial Standards Division, as assistant chief.

A.S.T.M. Issues 1946 Standards

The American Society for Testing Materials, 1916 Race St., Philadelphia 3, Penna., has issued its 1946 Book of A.S.T.M. Standards. The latest edition, with more than 1400 standards, specifications, tests and definitions, and containing almost 7,000 pages, has been issued in five parts instead of the former three volumes, as follows: Part IA, Ferrous Metals; Part IB, Non-Ferrous Metals; Part II, Nonmetallic Materials — Constructional; Part IIIA, Nonmetallic Materials—Coal and Coke, Petroleum Products, Aromatic Hydrocarbons, Soaps, Waters, Textiles, Gaseous Fuels; Part IIIB, Nonmetallic Materials—Electrical Insulating Materials, Plastics, Rubber, Paper, Shipping Containers, Adhesives. In cloth binding, Parts IA, IB, IIIA or IIIB are $8.00 each; Part II is $12.00; and a complete set of all five parts is $44.00. Copies may be obtained direct from the Society.

Report on Engine Vibration

A report dealing with the measurement of torsional vibration of engines has been made available by the Society of Automotive Engineers, 29 West 39th St., New York 18, N. Y. Entitled "Cooperative Testing of Torsiographs and Calibrators," the report covers a program of cooperative testing undertaken by a special committee of the S. A. E. and the U. S. Navy Bureau of Ships. The tests were conducted and the results are presented in such a manner as to provide direct comparisons of the results obtained with the various calibrators and torsiographs used. The report is priced at $3 for S. A. E. members and $6 for non-members.

Terilon Molding Compound

A new rubber-like molding compound, which is reported to be impervious to water, acids, alkalies, and temperatures up to 300° F., has been developed by Parrott Plastics, 666 South Front St., Elizabeth 2, N. J. Called Terilon, it is said to maintain very close tolerances and critical dimensions in reproducing models having extreme undercuts, since it can be stretched without any loss in its elasticity. Available in liquid form, the material is stable at room temperature and requires no special precautions for storage. The material may be brushed on or poured directly over the model, depending upon the nature of the work.

Cabot Seminar Hears Parkinson

Dr. D. Parkinson, chief tire compounder of the Dunlop Rubber Co., Ltd., Birmingham, England, was the principal speaker at one of the regular seminars of Godfrey L. Cabot, Inc., held recently in the Cabot laboratory in Boston, Mass. Dr. Parkinson presented a paper covering recent research work performed on carbon blacks in rubber at Fort Dunlop, England.

Heads Philback Laboratory

Lynn Harbison

Frank Andrews, Manager, Carbon Black Division, Chemical Products Department of Phillips Petroleum Company, has announced the appointment of Lynn Harbison as Manager of the company's Philblack Sales Service Laboratory at Akron, Ohio. Mr. Harbison brings to this laboratory twenty-one years of broad experience in the rubber industry. Following his work in the Mechanical Goods Division of the B. F. Goodrich Company he spent two years in Europe modernizing a rubber plant and further supplemented his experience in this field by work in the Mechanical Goods Division of the U. S. Rubber Company, at Passaic, New Jersey. For the past five years, he has been employed as a development chemist in the tire division of the Firestone Tire and Rubber Company. Mr. Harbison graduated with honors from the University of Missouri where he obtained both Bachelor of Science and Chemical Engineering degrees.

Coatings Department Created

A new Flexible Plastic Coatings Department has been organized by the Interchemical Corp. as part of its Finishes Division, with Chester M. Robbins, formerly vice-president of the company's Textile Colors Division, as sales manager. The new department, with sales headquarters at 57 State St., Newark 2, N. J., will specialize in the coating and decoration of such sub-strata as rubber, plastics, textiles, paper, leather, and metal foils, and will handle compounds for continuous film coatings, flocking compositions and adhesives, and gravure ink of the solvent type for application on textile print machines.

Geon Polyblend 500 X 503

A new thermoplastic material, which is the first in a series of colloidal blends of Geon polyvinyl chloride resin and Hycar nitrile rubber polymers, has been developed by the B. F. Goodrich Chemical Co., 324 Rose Building, Cleveland 15, Ohio. Designated as Geon Polyblend 500 x 503, the material has been especially designed for extruding and calendering, and is said to be unusually well adapted to embossing and press polishing operations. According to the company, the polyblend combines the toughness and chemical resistance of polyvinyl chloride with the solvent resistance and flexibility of nitrile rubber. It is also reported to be unique in that the valuable characteristics of vinyl elastomers are achieved with no liquid plasticizer. The nitrile component of the polyblend serves as a non-extractable, non-migrating, polymeric plasticizer.

Paraplex RG-10 Plasticizer

Resinous Products & Chemical Co., 222 West Washington Square, Philadelphia 5, Penna., has developed a new polymeric plasticizing resin which is intended for use with nitrocellulose, urea, and melamine resins. Designated as Paraplex RG-10, the new plasticizer possesses light color, and is claimed to have improved alcohol tolerance, greater solvency for nitrocellulose, unusual pigment stability, and increased adhesion to vulcanized rubber. It resists ultra-violet light and does not spew at temperatures as high as 325° F. Due to its color, durability, and flexibility, the plasticizer is recommended in high quality nitrocellulose coated fabrics, in white lacquer for use on rubber articles, and in tough, oil-resistant cable coverings.

Naugatuck BLE 25 Antioxidant

A new low viscosity antioxidant for rubber compounding has been developed by the Naugatuck Chemical Division of the U. S. Rubber Co., 1230 Avenue of the Americas, New York 20, N. Y. The new antioxidant, known as BLE 25, is said to protect rubber products equally as well or better than the company's regular BLE. BLE 25 has a viscosity of 20 to 50 poises, while the viscosity of BLE is 250 to 500 poises. According to the company, BLE 25 flows like water with a minimum of warming, is easy to drain from drums, and easy to add to mill or Banbury batches.

Hercules Powder Reduces Prices

A sweeping reduction, ranging from 10 to 25%, in the prices of major volume synthetic resins has been announced by the Hercules Powder Co., Wilmington, Del. Staybelite esters, for example, were reduced 25%. A major factor affecting the reductions was said to be the company's new, modern synthetic resin plant at Burlington, N. J., which is now in full operation.

COOPERATIVE RESEARCH EXPANDS PAN-AMERICAN RUBBER INDUSTRY

The joint efforts of the United States and Latin American countries to produce natural rubber during the war have set the stage for a major post-war industry in the tropical regions of the Western Hemisphere, according to a statement made recently by Dr. E. W. Brandes, who is in charge of rubber investigations for the U. S. Department of Agriculture.

Dr. Brandes pointed out that the cooperative natural rubber program has emerged from the nursery stage in Brazil, Columbia, Costa Rica, Guatemala, Haiti, Honduras, Mexico, and Peru. Approximately 29,000 acres of field plantings are now established in government demonstration areas, on coffee, banana, and other plantations, and on nearly a thousand small farms.

The cooperating governments are establishing central nurseries and modifying and coordinating their farm credit, colonization, and extension programs to meet the requirements of the long-term crop. The U. S. Department of Agriculture maintains scientists and technicians in various centers to conduct research and to train local workers.

The return of rubber as an economic crop in Latin America was made possible by the introduction of clones from high yielding Hevea trees from the Far East and by development of measures to control the destructive leaf blight. USDA pathologists have carried on a breeding program for several years and it is still in progress to develop resistant varieties of Hevea.

The technique they worked out for transplanting buds from resistant trees to the upper trunks of diseased trees has made it possible to start up orchards in areas formerly abandoned. Their development of a spray for controlling blight in seedling nurseries forged the remaining link in the chain of control of leaf blight.

Dr. Brandes said rubber plantings of 5 to 10 acres offer a profitable long-term enterprise to the small farmer in Latin America and will help build a diversified and permanent agriculture in the tropics. During the first three years, food crops such as corn, rice, beans, and manioca can be grown in the 20-foot spaces between tree rows. After the tenth year, the farmer is assured a yield of from 1,000 to 1,600 pounds per acre annually from bud-grafted resistant Hevea strains.

Bulletin on Geon Polyblends

A technical bulletin on the Geon 500 Series Polyblends, the company's colloidal blends of polyvinyl resins and nitrile rubber polymers, has been made available by the B. F. Goodrich Chemical Co., Rose Building, Cleveland 15, Ohio. Physical test data on a typical Geon polyblend compound for black press-polished sheetings is covered in the bulletin.

An FAO Prediction

The United Nations Food and Agriculture Organization predicted in a report issued on August 1 that the price of natural rubber would decline to 12½ cents a pound, continuing the downward trend from the 25¾-cent level in the third quarter of 1946. The report pointed out that the entry of large-scale Netherlands East Indies production into the world rubber market would materially affect current supply and demand developments.

Develops Good-rite Resin 50

A new high styrene-low butadiene copolymer has been developed by the B. F. Goodrich Chemical Co., 324 Rose Building, Cleveland 15, Ohio, for use as a stiffening agent in the manufacture of synthetic shoe soling. The company claims that the material is also well adapted to such applications as electrical insulation, protective coatings, and for molded items such as injection molded appliance plugs. Called Good-rite Resin 50, the resin is marketed as a white powder. It has a specific gravity of 1.045 and may be softened and sheeted on a mill at temperatures ranging from 150° to 225° F., or injection molded at temperatures ranging from 380° to 440° F., using a 45-second molding cycle. Unusual impact resistance, excellent resistance to water absorption, increased hardness, and good electrical properties are some of the characteristics that this new resin is said to impart to natural and synthetic rubbers.

To Address Faraday Society

Drs. Frank R. Mayo and Cheves T. Walling, of the General Laboratories of the U. S. Rubber Co., at Passaic, N. J., have been invited to address European scientists at a meeting of the Faraday Society, to be held at Oxford, England, from September 23 to 25. The purpose of the meeting, which is the first in the field since before World War II, is to exchange information on "free radical chemistry." Drs. Mayo and Walling will present three papers on basic synthetic rubber research at the meeting.

DuPont BAC Latex

An interpolymer latex having a 40% dry solids content has been developed by the Rubber Chemicals Division of E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del., specifically to act as a carrier for the resorcinol-formaldehyde type bonding agent. Known as BAC Latex, the latex is said to be especially useful for bonding nylon fibers to neoprene.

PRODUCTION OF CARBON BLACK ESTABLISHES RECORD IN 1946

Carbon black production and sales were in record volume in 1946, responding to larger demand from all classes of domestic consumers and export, according to the Bureau of Mines of the U. S. Department of the Interior. Production of 1,244,421,000 pounds exceeded the 1945 record by 18%, while sales expanded 24% over 1945 to 1,269,740,000 pounds. Sales to rubber companies increased from 804,386,000 pounds in 1945 to 941,464,000 pounds in 1946 and record quantities of black were taken by the ink and paint industries.

Producers' stocks of black declined to 76,228,000 pounds on December 31, 1946, as compared with 102,005,000 pounds at the end of 1945. Stocks of contact (channel) type blacks declined throughout the year. Furnace type stocks were built up moderately in the second and third quarters but declined in the fourth quarter.

Furnace black production gained 22% over 1945 to 625,312,000 pounds and was greater for the first time than that of contact type blacks—619,109,000 pounds. Although output of the Texas Panhandle district increased to a new high of 596,678,000 pounds of black of all types, its share of the United States total declined to 48% as compared with 51% in 1945 and 70% in 1941.

As the quantity of natural gas consumed in carbon black manufacture increased only 11% in 1946 to 478,349,000 cubic feet, the average yield increased from 2.32 pounds of black per thousand cubic feet of gas used in 1945 to 2.44 pounds in 1946. The average value at the plants of gas used was 3.02 cents per thousand cubic feet in 1946 and 2.28 cents in 1945.

Although exports of contact types were controlled, exports of all grades increased 56% to the unprecedented total of 271,085,000 pounds. The average value of carbon black at the plants increased from 4.02 cents a pound in 1945 to 4.82 cents in 1946 as prices of the principal contact grades advanced. A total of sixty plants operated in 1946, a net gain of one over 1945. One channel plant in Texas did not produce and two new furnace plants in Texas and Kansas were put in production.

Issue New Automotive Data

The Automobile Manufacturers Association, New Center Building, Detroit 2, Mich., has issued the 1946-47 edition of "Automobile Facts and Figures." According to the new edition, the 27th to be issued, one-sixth of all business concerns in the United States are automotive, based on production, sales service and use of motor vehicles. Some 537,000 automotive business places employ 8,200,000 persons, or one in every seven workers in the nation. Copies of the new edition can be secured without cost on direct request.

CLAY PIPING PROVES BOON TO COMPANIES FACING NEW CHEMICAL PROBLEMS

Today the large laboratories of the giant rubber industry are leaving no stone unturned in an experimentation program that has carried them far into new fields of plastics and many other of the products of modern chemistry.

Such deviation into diverse products has become standard procedure in almost every industry. The necessities of war kept chemists and scientists constantly searching for substitutes. In many cases these diligent probings unearthed materials, or "substitutes," that far surpassed the originals. Plastics were discovered that could be put to thousands of new uses.

Synthetics supplanted products that were supposed indispensable, and in many cases proved to be exceptional. New uses were found for new and old products alike. In all reality a second industry revolution had begun and the rubber industry was in the thick of it.

Constant experimentation demanded the wide use of acids, alkalies, and chemicals—the disposal of which after use demanded concern not only to the companies conducting the experiments, but to the cities in which these experiments were taking place. Sewers unsuited for carrying chemical waste became corroded and began disintegrating.

Engineers Foresaw Hazards

Engineers were quick to see the hazards of this widespread experimentation and new industrial trend. In many cases such precautions as large clay or ceramic vats collected the chemical wastes temporarily for neutralization before disposal and as soon as possible vitrified clay pipe replaced other pipe not impervious to chemical reactions. Safeguards were installed at every turn.

In the case of the rubber industry, executives thanked the foresight of their engineers as hundreds of feet of the vitrified pipe already lay beneath the long strings of factory buildings of Goodyear, Firestone, Goodrich, General, Seiberling, Sun and the hundreds of smaller companies. Aside from a few interceptor lines which had to be replaced at one plant the rubber industry found itself in good shape for the transformation.

Maintenance men at Goodyear have no idea of the total extent of disposal pipe that lays beneath their 110 major buildings, but they have checked to make sure that it is all acid-resisting. One Goodyear engineer believed the disposal lines to be about the only installation that wasn't affected in this vast industrial change. In the words of an official of Seiberling, the clay lines installed throughout that company "are suitable for almost any purpose" because they are non-corrosive.

From rubber calender rooms to research laboratories and aircraft plants, rubber construction and maintenance men have built and maintained about every type construction known to engineers. They have constructed tunnels, roads, bridges, overpasses, warehouses, airport installations and chemical vats. This new construction posed no problem for them—although all were grateful there were few waste lines to replace. One engineer at the B. F. Goodrich Co. asked to ready a portion of the plant for chemical research, said, "I found we had clay pipe installed in that section and breathed a lot easier. It's a real job to replace pipe and necessitates long work stoppages."

The chemical lines of the new Goodrich plastics plant near Marietta, Ohio, are constructed of clay pipe.

Industry Still Expanding

Goodrich and Firestone, too, have greatly expanded their laboratory facilities, and look into the future which they predict will bring even greater expansion. Goodrich recently put the finishing touches to a new research center in Brecksville, Ohio, where their engineers joined those of the town in installing a great new vitrified trade waste disposal system. Goodrich is also constructing a new "Koroseal" plant at Marietta, Ohio.

Firestone recently added a handsome research laboratory in Akron and a Pottstown, Pa., war plant to their growing string of scattered installations. The newest product bearing the familiar Firestone "F" is a steel barrel which they have just put into mass production.

Goodyear production during the war included, in addition to many rubber products, a line of metal products including the mighty Vought Corsair, the single-seated Navy shipboard fighter. Goodyear is now experimenting in cold boxes, and housing, and their Pliofilm has been a boon to those who have their own freezing units. Goodrich's Koroseal is now a household word. It is hard to know what will come out of the rubber industry next.

Part of the 110 major buildings of the Goodyear Tire & Rubber Co. at Akron. It is estimated that over 100 miles of clay pipe were used in the construction of these buildings.

The physical properties of Midco, a new whole tire reclaim based on blends of natural rubber and GR-S, and M-68, a standard natural rubber reclaim, are compared in a technical report which has been made available by the Midwest Rubber Reclaiming Co., East St. Louis, Ill.

NEW POLYMERS AUTHORIZED BY OFFICE OF RUBBER RESERVE, RECONSTRUCTION FINANCE CORPORATION

Listed below are types and properties of new experimental GR-S polymers (including GR-S latices) which have been authorized by the Office of Rubber Reserve, Reconstruction Finance Corporation, since publication of those in our previous issue. Procedures for the distribution and sale of these polymers will be found in our October, 1945, issue. Normally, experimental polymers are produced only at the request of the consumers with 20 bales of the original run set aside for distribution to other interested companies for their evaluation. Such rubber is available in quantities of one or two bales upon request to the Sales Division of Rubber Reserve within six months after the experimental polymer was produced. Subsequent production runs are made if sufficient requests are received to warrant it.

X Number	*Manufacturing Plant*	*Date of Authorization*	*Polymer Description*	*Special Characteristics*
X-398 GR-S	U. S. Rubber, Institute	7/16/47	71-29 butadiene-styrene polymer similar to X-383 except that Mooney will be 50 to 60 instead of 60 to 70. Cumene hydroperoxide activation at low temperature. Glycol will not be added to the reactor charge as an antifreeze as was done in the X-383 reactor charge.	Low temperature polymers have given indications of improved physical properties and processing characteristics. Of immediate interest in tire tread evaluation.
X-399 GR-S	U. S. Rubber, Institute	7/9/47	71-29 butadiene-styrene polymer, fatty acid soap emulsification, modified with tertiary C-16 mercaptan, at 25 to 35 Mooney, stabilized with UBUB, salt acid coagulation.	Low Mooney polymer made to reduce the breakdown time required before compounding. Originally designed for use in chemically blown sponge. However, X-399 may be of interest in many other end products.
X-400 GR-S Latex	Firestone, Akron	7/29/47	Low modification (Sulfole B-8) latex having 75 butadiene-25 styrene monomer ratio with mixed fatty acid soap and synthetic emulsifiers. Also contains inorganic salt, sodium pyrophosphate.	Improved X-342 type latex. Reported to be a high adhesion latex for tire cord solutioning.
X-401 GR-S			A non-staining and non-discoloring GR-S Black-1 type masterbatch containing 50 parts EPC black per 100 parts of GR-S (35 to 45 Mooney). Stabilizer scheduled as UBUB.	This masterbatch has not yet been authorized since insufficient permit requests have been received to warrant production. X-number will be cancelled unless additional permit requests are received. Designed for cover jacket on electrical cords and mottled rubber flooring.
X-402-SP GR-S	U. S. Rubber, Naugatuck	7/29/47	Same as regular GR-S-SP except that rubber will not be strained or milled after drying.	For experimental tire tests.
X-403-SP GR-S	U. S. Rubber, Naugatuck	7/29/47	Same as X-402 except Mooney viscosity will be 55 to 65.	For experimental tire tests.
X-404-SP GR-S	U. S. Rubber, Naugatuck	7/29/47	Same as X-402 except Mooney viscosity will be 65 to 75.	For experimental tire tests.
X-405 GR-S-SP	U. S. Rubber, Naugatuck		71 butadiene-28.5 styrene polymer cross-linked with a small quantity of divinylbenzene, having a mixed rosin and fatty acid soap emulsification and stabilized with UBUB. Compounded Mooney in standard recipe will be 125-145 ML-4 at 212°F. Salt acid coagulation.	Suitable for use either in blends with other GR-S polymers or natural rubber as well as in 100% X-405 compounds. Physical properties approximate that of standard GR-S (higher than GR-S-60 and X-344). For coated fabrics, molded products, hard rubber or any end product now using GR-S-60 or X-344.
X-406 GR-S-SP	U. S. Rubber, Naugatuck	8/11/47	95 butadiene-5 styrene ratio polymer, rosin soap emulsification with Mooney viscosity range from 60-70. Stabilized with BLE and salt acid coagulated	For experimental tire tests. High-butadiene low-styrene polymers tend to give improved low temperature properties to end product.

Form New Chemical Association

The name of the Technical Service Association of the Chemical Industry, an informal organization concerned with the marketing of new chemicals and the expansion of markets for manufactured chemicals, has been changed to the Commercial Chemical Development Association. Dr. L. B. Hitchcock, of the Quaker Oats Co., is president of the new association, established along more formal lines.

Produces Wire Cord Tires

Production of truck tires using wire cord has been started by the B. F. Goodrich Co., Akron. The new tires, which have fewer plies than tires of the same section size made with conventional cord fabric, are reported to run cooler than any conventional tire under equivalent conditions. This factor coupled with higher strength is expected to give enough greater total mileage to offset the higher initial cost of the tire.

Plans New Research Laboratories

Plans for the construction of new research laboratories on a forty-acre site near Lancaster, Penna., have been announced by the Armstrong Cork Co. The laboratories will consist of a two- and three-story main research building, a large single-story pilot plant, several smaller pilot plants, and a boiler house. The company plans to have the new laboratories ready for use by the summer of 1949.

NAMES IN THE NEWS

S. E. Shepard, who served as replacement sales manager of Raybestos-Manhattan,Inc., for fourteen years before his retirement in 1945, has joined the Asbestos Manufacturing Co., Huntington, Ind., as vice-president and general sales manager.

Robert Price, formerly manager of technical service and development in the plastics division at the Akron plant of the B. F. Goodrich Co., has been appointed manager of the development department for the plastics division at the company's Marietta, Ohio, plant.

Frederick J. Riker, formerly manager of the forge blanks division of the Crucible Steel Company of America, has been named president of the Livingstone Engineering Co., Boston 9, Mass., manufacturers of electric steam generators.

Dr. M. L. Crossley, director of research for the American Cyanamid Co., Bound Brook, N. J., has been awarded the honorary degree of Doctor of Science from Wesleyan University, Middletown, Conn.

Charles F. Hosford, Jr., president of the Pennsylvania Coal Products Co., Petrolia, Penna., until its recent consolidation with the chemical division of Koppers Co., Inc., has been appointed a vice-president in the Koppers chemical division.

B. H. MacLeod, formerly connected with the Brown Shoe Co., and previously associated with the Avon Sole Co. and Alfred Hale Rubber Co., has been named general sales manager of the Gro-Cord Rubber Co., Lima, Ohio, succeeding Virgil M. Knisely, who is now in charge of the company's replacement sales division.

Robert M. Simpson, who has been associated with the Columbia Chemical Division of the Pittsburgh Plate Glass Co. since 1944, has been appointed acting district manager for the Chicago territory, with headquarters in the Tribune Tower Building, Chicago.

Edwin B. Newton, director of technical research of the B. F. Goodrich Co., Akron, has been named chairman of the Akron Section of the American Chemical Society.

E. V. Murphree, formerly executive vice-president of the Standard Oil Development Co., Elizabeth, N. J., who contributed to the development of the catalytic process for making butadiene from petroleum, has been appointed president of the company.

J. Warren Kinsman, general manager of the fabrics and finishes division of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has been appointed a vice-president of the company.

Lyman B. Brainard, formerly business manager of the automotive equipment division of the Russell Manufacturing Co., Middletown, Conn., has been named sales manager of the division.

William Gerecke, formerly chemist at the Perth Amboy, N. J., plant of the General Cable Corp., has been appointed technical superintendent at the company's St. Louis, Mo., plant.

H. H. Bashore, well-known rubber technologist, who has been operating his own plastics business in Chicago for the past several months, has joined the Swan Rubber Co., Bucyrus, Ohio, as director of research.

U. J. H. Malo, formerly associated with Firestone, Anaconda Wire and U. S. Rubber, has joined the Crescent Co., Pawtucket, R. I., as chief chemist, succeeding W. Birkett, resigned. Earl H. Ashley, Jr., formerly with DuPont, and D. P. Kinniburgh, formerly with Anaconda, have also joined the Crescent staff.

Frank H. Hart, formerly associated with the Anaconda Wire & Cable Co., is now manager of the Sycamore, Ill., plant of the Diamond Wire & Cable Co.

Almon G. Hovey, who has had some twenty-five years of experience in the synthetic resin field, and who has been associated with General Mills, Inc., for the past three years, has been appointed in charge of technical sales service of the Chemical Division of that company. He will make his headquarters at Minneapolis, Minn.

E. S. Nickerson, associated with the Fabrics and Finishes Department of the DuPont company for many years, has been named general manager of that department, succeeding J. Warren Kinsman, who was recently made a vice-president of the company.

Allen M. Varney, formerly chief chemist of the LaCrosse Rubber Mills Co., has joined the Servus Rubber Co., Rock Island, Ill., in a similar capacity.

H. B. Rasmussen, formerly manager of the Chicago office of the J. T. Baker Chemical Co., has now taken up new duties with the company at Phillipsburg, N. J., as sales manager of the Laboratory Chemical Division.

Ching Accepts Mediation Post

Cyrus S. Ching, associated with the U. S. Rubber Co. for the past 28 years, the last 18 of which he served as director of industrial and public relations, is retiring from that company to accept an appointment by President Truman as director of the new Federal Mediation and Conciliation Service created by the Taft-Hartley Act. He is 71 years of age. At various times Mr. Ching has been called to Washington to advise the government on labor problems. In 1941 he served on President Roosevelt's National Defense Mediation Board. At the outbreak of World War II he was appointed chairman of the committee to convert the automobile industry to war work. From 1942 to 1943 he was a member of the War Labor Board.

Galliher Heads Two Units

W. I. Galliher, executive sales manager of the Columbia Chemical Division of the Pittsburgh Plate Glass Co., has been appointed to a similar capacity with the Southern Alkali Corp. in order to correlate the sales activities of the two units. As executive sales manager for both units, Mr. Galliher will maintain his headquarters at Fifth Avenue and Bellefield Street, Pittsburgh, Penna. Associated with Columbia Chemical since 1931, he was director of sales for the division's heavy industrial chemical products for twelve years. Southern Alkali maintains sales branches in New York City, Dallas, Houston, and Corpus Christi.

Willard C. Gulick, formerly general sales manager of the export division of the B. F. Goodrich Co., has been named president of the International B. F. Goodrich Co., succeeding Stanley W. Caywood, retired.

Leland E. Spencer, manager of the Topeka, Kansas, tire factory of the Goodyear Tire & Rubber Co., has been loaned to the War Department for a year on a leave of absence basis to assist General Lucius D. Clay in the economic rehabilitation of Germany.

Isaac W. Robertson, manager of the Detroit, Mich., branch of the Dryden Rubber Co., has been elected a director of the company.

Ralph D. Au, who was head of the New York office of crude rubber inspection for the B. F. Goodrich Co. before being loaned by the company to the Office of Rubber Reserve in 1942, has been appointed manager of the company's rubber purchasing department.

Edward H. Robbins, formerly chief chemist of the Atlas Latex Co. and prior to that associated with the Flintkote Co., has joined the Pioneer Latex & Chemical Co., Middlesex, N. J., as director of research.

Complete Arrangement Committees

Simon Collier, Director of Quality Control of the Johns-Manville Corp., present chairman of the New York Rubber Group, who is also functioning as chairman of the Local Arrangements Committee for the meeting of the A.C.S. Rubber Division at the Hotel Commodore in New York City next month, has revealed the names of full members of the various subcommittees. These are as follows:

Banquet Committee: E. S. Kern (Vanderbilt), chairman; I. E. Lightbown (Enjay), G. P. Mack (Advance Solvents), B. B. Wilson (*India Rubber World*). Mr. Wilson will handle the entertainment details.

Meeting Rooms: G. R. Lawson (Sharples Chemicals), chairman.

Treasurer: J. H. Nesbit (U. S. Rubber Reclaiming), chairman; R. H. Walcott (Stauffer Chemical).

Registration Committee: P. P. Murawski (DuPont), chairman; G. Vacca (Bell Telephone), Emil Krismann (DuPont), Ken Soule (Manhattan Rubber), G. Maassen (Vanderbilt), T. Callahan (Witco), P. P. Pinto (RUBBER AGE).

Information Booth: George Wyrough (Philblack), chairman; T. A. Bulifant (Barrett), E. J. Butler (General Electric), L. R. Cranston (U. S. Rubber), M. E. Davis (Harwick Standard Chemical), George Grove (N. J. Zinc), S. M. Martin (Thiokol), G. H. Provost (U. S. Rubber), K. J. Soule (Manhattan Rubber), E. C. Strube (Manhattan Rubber), J. E. Waters (General Cable).

Hospitality: D. E. Jones (American Hard Rubber), chairman.

Vendors' Cocktail Party: John Hamilton (Binney & Smith), chairman.

Publicity: R. G. Seaman (*India Rubber World*), and M. E. Lerner (RUBBER AGE), co-chairmen.

Tire Shipments Up Considerably

Shipments of passenger car tires by manufacturers during the first six months of 1947 amounted to 36,323,946 units as compared with 30,648,535 units during the same period of 1946, an increase of 18.52%, according to the Rubber Manufacturers Association. During the month of June, passenger tire shipments increased from 5,889,459 in May to 6,206,308, a gain of 5.38%. Truck and bus tire shipments in the first six months of the present year amounted to 8,508,856, as compared with 7,548,051 in the corresponding 1946 period.

Arabol Buys St. Louis Chemical

The Arabol Manufacturing Co. of New York City, which operates several adhesive plants throughout the country, has acquired and will operate as an adhesives manufacturing plant the St. Louis Chemical & Manufacturing Co. of St. Louis, Mo. The latter plant has been producing latex and rubber cements among other types of adhesives.

Opens San Francisco Office

B. E. Dougherty Co., manufacturer, manufacturer's representative, and jobber of chemicals, pigments, and raw materials to the rubber and allied industries in the Pacific Coast area, has opened an office and warehouse at 725 Second St., San Francisco 7, Calif., with

Arthur E. Wolff
heads new San Francisco office

Arthur E. Wolff as manager. The general offices and warehouse of the company are located at 1807 East Olympic Blvd., Los Angeles 21, Calif. The new office will handle approximately the same materials as does the company's Los Angeles office, and will serve the area of Northern California, and the states of Oregon and Washington.

Organized about twenty years ago, the B. E. Dougherty Co. represents such organizations as Cabot, General Atlas, W. C. Hardesty, American Turpentine, Glidden, Crowley Tar Products, Franklin Mineral Products, Sierra Talc, Holliston Mills, Hardesty Chemical, and Progressive Varnish.

Before joining the Dougherty organization, Mr. Wolff was associated with the New Jersey Zinc Co. in the Pacific Coast area for over twenty years in connection with the sale of zinc oxide and related products. He joined the sales staff of New Jersey Zinc immediately after graduating from the University of California, and served with the company in several varied capacities. In 1928, he was appointed Southern California manager of the company, and served in that capacity until 1943 when he was promoted to the position of assistant to the Pacific Coast manager, the post he held at the time of his resignation earlier this year.

Make Payday Bonday
Buy U. S. Savings Bonds

ORR Sets New Prices

At the time the Office of Rubber Reserve announced new prices for natural rubber and liquid latex, it was stated that prices of special crepes would be announced later. These prices have now been set and effective June 16, 1947, all sales of pale crepe made by Rubber Reserve will be sold on the basis of the new price schedule which ranges from 28¼c a pound for No. 3 Thick or Thin Pale Latex Crepe to 32⅞c a pound for R.C.M.A. Watermarked Crepe No. 16. No. 1X Thick or Thin Pale Latex Crepe is now 29c a pound. Uniform freight charges apply in all cases. ORR also announced on July 25 that effective with permits issued for delivery during August, 1947, GR-M and GR-M-10 shipped from the Louisville, Kentucky, plant will be sold at 32c a pound, plus applicable freight charges. GR-M-10 will be sold at 34c a pound ex warehouse on shipments made from West Coast warehouses. On July 16 ORR announced that it had approximately 300,000 pounds of GR-I-X, the modified polyisobutylene produced for wartime requirements, which it will sell at the reduced price of 15c a pound plus freight charges.

Pyramid Rubber Company Sold

Controlling interest in the Pyramid Rubber Co., Ravenna, Ohio, has been sold to Houston, Texas, business interests. R. W. Askanase has been appointed president of the company, succeeding W. B. McIntosh, who will continue as chairman of the board. Other officers of the company include: Cyril Porterhouse and A. J. Farfel, vice-presidents; John Barrett, secretary-treasurer; and W. O. Taylor, assistant secretary-treasurer. Mr. Porterhouse continues as factory manager, while L. A. Crow will continue as director of sales.

Introduce Covinylblak BA

A new dispersion of a high color carbon black in vinyl resin, which is said to find wide application for the compounding of such items as polished sheets and extruded goods, has been developed by the Binney & Smith Co., 41 East 42nd St., New York 17, N. Y. Designated as Covinyblak BA, the material is said to possess the following advantages: faster compounding of carbon black, cleanliness, enhanced jetness, better gloss, and economy in carbon black content.

Induction Heating Moves Plant

Induction Heating Corp., manufacturer of Ther-Monic induction and dielectric heating equipment, has moved its general offices, laboratory and manufacturing facilities to 181 Wythe Ave., Brooklyn 11, N. Y. The company will occupy the entire second floor of its new building, an area more than twice the size of its former plant.

FINANCIAL NEWS

NET INCOME OF $11,020,729 REPORTED BY U.S. RUBBER CO.

U. S. Rubber Co. has reported a net income of $11,020,729 for the first six months of 1947, after deducting all charges, including $1,000,000 provision for adjustment of certain raw material inventories. The result is equivalent, after preferred dividend requirements, to $4.78 a share of common stock, and compares with $9,906,886, or $4.15 a common share, for the corresponding period of the preceding year.

Consolidated net sales of $283,329,180, the largest for any half-year period in the company's history, increased 22% over the $231,710,008 volume for the corresponding six months of 1946. Sales exceeded by 5½% the previous high of $268,448,000 established in the first half of 1945. All operating divisions, including tire, footwear, mechanical goods, textile, and chemical, contributed substantially to the increased volume of business, according to a statement accompanying the report.

The report states that tentative provision for writing down certain raw materials, principally natural rubber, to market prices has been made in the amount of $1,000,000. Final adjustment, if necessary, will be made at the year end.

The consolidated balance sheet of the company as of June 30, 1947, shows current assets of $236,664,895, including cash of $38,469,010, accounts and notes receivable of $63,415,135 and inventories of $132,225,419. Current liabilities were $61,196,500. As of December 31, 1946, current assets amounted to $187,151,930, of which cash was $25,750,939, accounts and notes receivable, $57,143,322 and inventories, $101,086,716, while current liabilities stood at $68,668,142.

General Tire & Rubber Co.

Six Months Ended May 31: Net profit of $2,650,912, after deducting $1,840,000 for Federal income taxes and $642,304 for depreciation, which is equal to $4.06 a common share, and which compares with $3,237,831, or $5.19 a common share, for the corresponding period of the previous fiscal year, when $1,000,000 was provided for contingencies. Sales amounted to $61,716,823, as compared with $48,071,662 for the corresponding period of the previous fiscal year.

Rome Cable Corporation

Second Quarter: Net income of $367,774, which is equal to 91c a common share, an increase of 57% over the $233,488 earned during the second quarter of 1946.

Seiberling Rubber Co.

First Half: Net income amounted to $52,178 as compared with $615,873 for the corresponding period of the previous year. Net sales amounted to $13,421,609, against $13,860,961 for the first half of 1946 despite a 36-day strike in April and May. The strike, which crippled production in the company's Barberton, Ohio, plant for seven weeks, was said to have caused an estimated loss in gross profits of $578,000.

Brown Rubber Co.

First Half: Net income of $413,300, after deducting all charges including provisions for depreciation and Federal income taxes, which is equal to $1.64 each on 251,100 shares of common stock, and which compares with $361,728, or $1.44 a share, for the corresponding period of the previous year. As of June 28, 1947, total current assets amounted to $1,341,882, while current liabilities stood at $618,862.

Dewey & Almy Chemical Co.

First Half: Net income of $335,351, which is equal to $1.09 each on 307,215 common shares, and which compares with $278,744, or 91c a share, for the first six months of 1946. Net sales amounted to $7,061,259, an increase of 19.6% over the $5,903,553 reported for the corresponding period of the previous year.

St. Joseph Lead Co.

First Half: Net income of $6,706,814, after deducting $2,688,981 for taxes, which compares with $2,793,061 for the corresponding period of the previous year when $866,532 was deducted for taxes. Sales amounted to $38,258,533 as compared with $26,356,461 for the first six months of the preceding year.

Hewitt-Robins, Inc.

First Half: Net profit of $726,311, which is equal to $2.60 a share, and which compares with a net loss of $245,178 for the corresponding period of 1946. Net sales amounted to $11,138,914, as compared with $6,237,998 for the first six months of the preceding year.

General Cable Corporation

First Half: Net income of $3,265,910, which is equal to $1.48 a common share, and which compares with a net loss of $1,008,939 for the first half of the preceding year when work stoppages took place at five of the company's plants.

GOODYEAR TIRE & RUBBER CO. REPORTS NET OF $11,601,416

Based on a new peacetime record in sales amounting to $316,467,215, the Goodyear Tire & Rubber Co. earned $11,601,416, after providing an interim reserve of $2,000,000 in connection with its interests outside the United States, for the first six months of the current year, according to a report issued by P. W. Litchfield, chairman of the board. The previous six-month peacetime high was $282,736,171, reported for the first half of 1946.

The 1947 six-month earnings is equal to $4.90 a common share and, except for last year's first half record of $15,088,189, or $6.59 a share, exceeded those of any comparable period in the company's history.

Goodyear's foreign business has expanded, but various new international exchange regulations still require clarification, Mr. Litchfield said. Generally speaking, markets for the company's various products have now attained a balance between demand and supply, he declared.

Inventories of $151,256,455 as of June 30, are carried in the consolidated balance sheet on the basis of cost or market, whichever is lower. Crude rubber on hand and on commitment has been written down to June 30 market through reserves provided for that purpose on Dec. 31, 1946.

The end of the six months period, Mr. Litchfield pointed out, coincided with the approximate low point of the crude rubber market which has subsequently advanced.

Working capital of the company increased to $175,932,000, compared with $158,000,000 a year ago. All renegotiation of war contracts has now been completed, the closing adjustment being covered by reserves provided in the previous year.

Plymouth Rubber Co.

Six Months Ended May 31: Net profit of $1,122,704, which is equal to $1.24 each on 900,000 common shares. Comparable figures are unavailable since prior to recapitalization and public sale of 300,000 shares of present stock in April, 1947, the company's stock was closely held. Net profit for the year ended November 30, 1946, amounted to $2,149,549, or $2.38 a share on present capitalization. Sales for six months to May 31, 1947, totaled $6,265,762, which compares with $12,678,315 for the year ended November 30, 1946.

Crown Cork & Seal Co.

First Half: Net income of $1,881,830, which is equal to $2.66 a common share, and which compares with $1,200,857, or $1.53 a share, for the first six months of 1946. Net sales amounted to $35,190,523, as compared with $27,701,063 for the corresponding period of the previous year.

Goodyear Super Cushion Tire

Forty-five years of evolution in the design of automobile tires were said to have reached their climax on August 7 with the formal introduction by the Goodyear Tire & Rubber Co. of its new Goodyear Super Cushion Tire. The new tire is larger and is designed for use on wider base rims than those in common current usage. The tires require 14% less air pressure (from 4 to 6 pounds less per tire depending upon the car which they equip) and are relatively lighter in comparison to their size than conventional tires. They are also said to be far more flexible and supple than conventional units, as well as being fatter and more attractive in appearance. The new tires are designed for use on 15-inch wheels and rims, averaging 70% of the width of the tire cross-section for new cars introducing the tires in the original equipment market. Advantages of the Super Cushion tire are said to include smoother riding, improved roadability, increased resistance to bruising and cutting, increased average tire mileage, increased traction, reduced vibration, easier steering on curves, reduced driving efforts, increased safety on road shoulders and car tracks, and less objectionable and lower level of road noise.

New Data on Rubber History

Revelation of some new early Spanish references to rubber dating back to the 16th century, and some remarkable notes on Mexican or Aztec picture-writings which push the first reference to rubber back from 1530 probably to as early as the 6th century, is contained in an article entitled "Rubber Among the Mexican Indians" in the July, 1947, issue of the *Journal of Rubber Research*, published by the Research Association of British Rubber Manufacturers, Croydon, England. The article is based on a valuable collection of notes and drawings supplied to the Association by C. A. Burland, Fellow of the Royal Anthropological Institute. The new references indicate that rubber was used at one time as a material for paying tribute to reigning monarchs and also was intimately associated with devil-worship and other barbaric religious rites.

U. S. Rubber has introduced an oil-resistant compound for splicing electrical wire. Made of neoprene combined with special synthetics, the compound is recommended for use on any electrical circuit coming in contact with oil.

Data on the physical characteristics of GR-M stocks incorporating Thiokol TP-90B is contained in a technical bulletin which has been made available by the Thiokol Corp., 780 North Clinton Ave., Trenton 7, N. J.

A catalog describing the company's complete line of torsion testing machines has been made available by the Tinius Olsen Testing Machine Co., 598-V North 12th St., Philadelphia 23, Penna.

Rubber Suspension in New Car

A new lightweight, six-seater automobile of progressive design, including the same rubber-in-torsion principle for suspension found in the Torsilastic spring of the B. F. Goodrich Co., Akron, has been designed by Sir Roy Fedden, British aircraft engine expert. The automobile has a four-cylinder, aluminum-block engine of 122 cubic inches piston displacement, which is a little more than half the motor capacity of popular-make American cars.

ORR Makes Bulletins Available

The properties and applications of GR-S-60, GR-S-65, and GR-S Latex, Type V, are described individually in three new bulletins which have been made available by the Office of Rubber Reserve, Reconstruction Finance Corporation, Washington 25, D. C. GR-S-60 is a processing aid for standard or special purpose GR-S polymers, natural rubber, or neoprene, while GR-S-65 is a special purpose synthetic rubber with superior electrical properties, low water absorption, low soap content, and low ash content. GR-S Latex, Type V, is a special purpose synthetic latex with high rubber solids, relatively large particle size, low soap content, low viscosity, and rapid drying rate.

To serve manufacturers seeking factory location sites in California, the California State Chamber of Commerce, San Francisco, Calif., has issued a comprehensive guide to sources of information and service. Entitled "Factory Location in California," the guide lists and describes specific departments of chambers of commerce, railroads, gas and electric facilities, banks, and other service sources.

A new line of portable electrical cords featuring a heavy duty neoprene jacket to provide increased protection against abrasion and damage has been introduced by U. S. Rubber. Called U. S. Royal Master Cords, the cords will be made in sizes ranging from 10 to 18.

A hand-size computor, called the Dillon Tensile Strength Computor, for quickly determining the tensile strength and breaking strength of any given material, has been made available by W. C. Dillon & Co., Inc., 5410 West Harrison St., Chicago 44, Ill.

A new bulletin, entitled "Studies in Centralized Lubrication," which contains case histories of organizations using the company's centralized system of lubrication, has been made available by the Farval Corp., Cleveland 4, Ohio.

Plan Tire Antitrust Action

As a result of executive hearings conducted by the House Small Business Committee, action to correct alleged monopoly evils in the tire industry will be undertaken jointly by the Antitrust Division of the Department of Justice and the Federal Trade Commission, according to Rep. Walter C. Ploeser, chairman of the committee. The Department of Justice has had a tire industry investigation under way since early in 1945. During most of this time the FTC has refrained from instituting tire cases to avoid duplication of pending Justice Department actions. Now, however, the FTC will handle problems of unjustifiable price concessions to mass purchasers, while the Department of Justice handles other phases of the tire monopoly problem. FTC plans to launch its investigation by sending a questionnaire to rubber tire manufacturers and mass distributors.

Develops New Organic Chemical

A new organic chemical, designated as 2-Mercapto-4, 6, 6-trimethyl thiazine (M.T.M.T.), which is expected to find many applications in a wide variety of fields, has been developed by the B. F. Goodrich Chemical Co., 324 Rose Building, Cleveland 15, Ohio. A yellow, crystalline material, insoluble in water but soluble in ketones and esters, the new chemical is heterocyclic in nature. M.T.M.T. is said to react as a tautomeric compound with the active hydrogen atom shifting from sulfur to nitrogen as the reaction conditions are changed. Esters, metal salts, and other derivatives are prepared readily and in good yields. The chemical is reported easily dimerized, the dimer itself being quite reactive.

To aid in the prevention of coal mine accidents, U. S. Rubber has placed on the market a new cable that will not spark when short circuited. A feature of the cable is a fine strand of copper wire embedded between the inner and outer layers of insulation.

A brake lining, which is said to be the largest ever made, is being manufactured by Raybestos-Manhattan, Inc., for use in Europe on the hoists of rehabilitated mines destroyed during the war.

U. S. Rubber has developed a new vulcanizing cement especially for use in repairing rayon cord tires. The high degree of penetration of the cement is said to provide a better mechanical anchorage to the rayon cord as well as to the rubber between the cords.

An eight-page brochure on Airfoam, the company's foamed latex upholstery and mattress material, has been made available by Goodyear.

ROLE OF RUBBER IN EXPERIMENTAL UNIVERSAL MILITARY TRAINING

Rubber has played its part in the first experiment in universal military training in this country. At Fort Knox, Kentucky, last January the Army Ground Forces set up a Universal Military Training Experimental Unit. Its purpose was to test the plan, laid down by the War Department, for a program to train teen-age civilians should Congress enact legislation making military training compulsory.

With eleven branches of the service represented in the group undergoing training, transportation and equipment galore was needed. This meant rubber—lots of it! Tires for jeeps, trucks, amphibious vehicles, tank treads, shoes. In the signal platoon alone rubber was on hand in practically every form—assault wire, waterproofed field radio sets, rubberized carrying bags, headphones, hand sets, shock mountings, push button shields and dozens of other uses of rubber were noted.

To carry the mud-slogging infantry over rough terrain, in all kinds of weather, boots with rubber soles and heels stood the acid test of training as they stood the rough usage of war. About 1,328 pairs of shoes were issued to trainees exclusive of those used by the cadre. A drop in the bucket—true! But make up a trainload of the erasers, gloves, boogie wheels, insulating tape, shock absorbers, raincoats and the host of other rubber or rubberized articles used for the training of 664 men for a six months' period. Then the picture assumes worth while importance.

The vital need for rubber in the myriad products of modern living is no revelation to anyone. We felt the pinch during the war years and were only saved by the persistence of scientific research in the years past. The wide use of rubber, in a single battalion of the Universal Military Training Experiment, is far from imposing. The need for quantities of rubber, in the event of a military training program on a national scale, however, would represent a major contribution by the rubber industry to national defense. It would mean not 664 pairs of overshoes but 1,106,224 pairs of overshoes and correspondingly greater amounts of rubber and rubberized products such as life-rafts, tires, raincoats and an untold number of other items using rubber without which the modern army is handicapped.

Rubber alone will not guarantee the peace or the defense. The ever vital question of men, their training, discipline and morale will always be the deciding factor in the final analysis. But, good equipment, coupled with well-trained, well-disciplined men, will always comprise an unbeatable team. In the right combination rubber will unquestionably play its part in building a huge national shock absorber against any foreseeable impact of the future.

At least a mile of tires are in evidence in the Universal Military Training Experimental Unit, for practically every type of vehicle known to the Army is used during the course of training.

Production of Tires in May

Passenger car tire production by American manufacturers during the month of May, 1947, amounted to 6,525,781 units, a decrease of 2.76% from the 6,711,133 units produced during the preceding month, according to the Rubber Manufacturers Association. During the first five months of 1947, production of passenger car tires totaled 33,527,870 units, as compared with 25,812,107 units produced during the corresponding period of the previous year. Production of inner tubes in May declined 18.9%, from 7,093,113 units to 5,752,429 units. Shipments of passenger car tires by manufacturers during May continued at peak levels, exceeding the April shipments of 5,859,164 units by .5%. Shipments for the first five months of the year amounted to 30,117,638 units, an increase of 18.93% over the 25,322,923 units shipped during the similar period of 1946.

ORR Clarifies Sales Procedure

Since the issuance of Rubber Order R-1, as Amended July 14, 1947, there has been some confusion regarding the proper procedure for the purchase of GR-S and GR-I. While the amended rubber order no longer requires consumers to obtain authorization from the Office of Materials Distribution of the Department of Commerce (as successor to the Civilian Production Administration) in connection with synthetic rubber, it is still necessary that requests to purchase be forwarded direct to Distribution Department, Office of Rubber Reserve, Reconstruction Finance Corporation, 811 Vermont Ave., Washington 25, D. C. Upon receipt of requests, ORR will issue purchase permits direct to the applicant in the same manner as heretofore, if the particular type of synthetic rubber requested is available.

Report on Kent State Work

Due credit to the work performed by students at Kent State University in the synthetic rubber program was voiced recently when the Goodrich laboratory maintained at the university was closed. One of a number of universities selected to do special work on synthetic rubber under supervision of industrial research men, the laboratory maintained by Goodrich at Kent State was unique in that it was the only one set up and operated by a rubber company. It has also been revealed that GR-S-10 was produced at the yearly rate of some 300,000 tons after experiments at the Kent State laboratory proved that it could be manufactured in large quantities.

Dougherty Named Coast Agent

The General Atlas Carbon Co., a subsidiary of Godfrey L. Cabot, Inc., has announced the appointment of the B. E. Dougherty Co. as its exclusive agents on the Pacific Coast for the sale of Gastex and Pelletex. The Dougherty organization, which maintains offices in both Los Angeles and San Francisco, has been acting as sales agent for rubber grades of Cabot carbon black in the Los Angeles area for many years. The new arrangement expands application of a policy adopted some time ago to coordinate Cabot and General Atlas sales and distribution services to the rubber industry.

Announce Change of Name

The Clay Department of Moore and Munger has changed its name to P. W. Martin Gordon Clays, Inc. No change in personnel has been made and E. W. Schwartz remains as technical sales representative with W. H. Shields as in the past for the sale and use of Buca, Catalpo, Pigment 33, Whitetex and Synthetic 100 (the polyisobutylene produced by the Standard Oil Co. of New Jersey). Headquarters remain at 33 Rector St., New York 6, N. Y.

N. Y. Holds Golf Tournament

Approximately 80 members and guests attended the Golf Tournament of the New York Rubber Group, held at the Winged Foot Golf Club, Mamaroneck, N. Y., on August 5. This was the first time that the group had held a golf tournament separate from the regular outing and the size of the attendance indicated that it would probably be a regular procedure in the future. H. F. Jones (Huber) won low gross with a score of 77, with E. A. Engdahl (U. S. Rubber) runner-up with a 78. A. B. Mullalay (Advance Solvents) won low net with 65, and J. R. Shaw (Lee Rubber) was second with a 69. Prizes in the kicker's handicap went to C. E. Richardson (National Automotive Fibres), J. F. Schreiber (U. S. Rubber), and M. Buffington (Lea Fabrics). Prizes were also given to all golfers securing birdies. All prizes were supplied by the group itself. Jean H. Nesbit (U. S. Rubber Reclaiming) was chairman of the committee in charge of the tournament, assisted by D. E. Jones (American Hard Rubber), D. F. Cranor (Binney & Smith), and E. B. Curtis (Vanderbilt).

To Sponsor Technical Program

The Northern California Rubber Group will sponsor one of the technical conferences at the Pacific Industrial Conferences, which will be held in conjunction with the 1947 Pacific Chemical Exposition, in San Francisco, Calif., from October 21 through 25. The following papers are scheduled to be presented at the rubber group conference: *Chemistry of Rubber,* by Dr. W. E. Elwell (California Research Corp.); *Carbon Black and Other Compounding Agents,* by William R. Snyder (Vanderbilt); and *Foam Rubber, Hard Rubber, and Other Specialties,* by Ralph T. Hickcox (Goodyear). Also scheduled on the program is a paper by Walter E. Boswell (Thiokol) on Thiokol and another by E. N. Cunningham and R. M. Howlett (Enjay) on Perbunan.

General and URWA Sign Pact

The first labor contract in the rubber industry since the enactment of the Taft-Hartley Law was signed on July 29 by the General Tire & Rubber Co., Akron, and the United Rubber Workers of America (CIO). The main provision of the new contract, which is retroactive to June 30, 1947, grants workers with ten or more years of service severance pay in the event that their services are terminated under certain conditions. Wages were not part of the negotiations.

Seeks Sales Agency in India

Eastern Commercial Trading Co., Khetwadi Eighth Lane, Bombay 4, India, is interested in hearing from American rubber manufacturers who wish to establish commercial contacts in that country.

Seek Buna Plant

Because natural rubber is now available at almost the same price that it costs to produce synthetic rubber, the French Military Government has asked the Allied Control Council in Germany to make the large Ludwigshafen buna plant available for reparations. The plant, which is part of the industry prohibited to Germany, has been allowed to operate because the disparity between natural and synthetic rubber prices would raise French occupation costs.

Announces Executive Promotions

U. S. Rubber Co. has announced three executive promotions in its tire division. Walter D. Baldwin, formerly sales manager of the company's U. S. Tires Division, has been appointed director of manufacturers sales, while J. Chester Ray, formerly sales manager of the Fisk Tires Division, has been named to succeed Mr. Baldwin. Harry M. Ramsay, who has been sales manager of the company's tractor and implement tire division at Detroit, Mich., since 1941, has been appointed sales manager of the Fisk Tires Division. Mr. Baldwin, with headquarters in Detroit, will handle the sale of original equipment tires to automotive manufacturers. Mr. Ramsay and Mr. Ray will maintain their headquarters at the company's general offices in New York.

Ottawa Leases New Building

Ottawa Rubber Co., 212 Main St., Toledo 1, Ohio, has leased a one floor cement block building on a two and one-half acre plot in Bradner, Ohio, about 25 miles south of Toledo. With approximately 5,500 square feet of floor space, the new building, which is being readied for operation, will be used by the company for the manufacture of its full line of rubber products. The company's general offices and warehouse will be maintained at the present Toledo address.

Machine Firms Join Interests

Farrel-Birmingham Co., Inc., Ansonia, Conn., has announced an arrangement with John Bertram & Sons Co., Ltd., Dundas, Ontario, Canada, by which Farrel-Birmingham processing equipment for the manufacture of rubber and plastics will be built by the Canadian organization. Farrel-Birmingham products manufactured by Bertram will now be procurable through the Canadian firm's headquarters at Dundas and branch sales offices at Vancouver, Winnipeg, Windsor, Toronto, and Montreal.

Southern Ohio Sets Program

The Southern Ohio Rubber Group has announced details of its program for the meeting scheduled to be held on October 9 at the Gem City Club, 121 So. Ludlow St., Dayton, Ohio. Originally scheduled for September 18, the date of the meeting was changed to avoid conflicting with the meeting of the A.C.S. Rubber Division in New York. The program will feature a talk on "Molds as Applied to Rubber and Plastics" by H. O. Poock, chief tool engineer of the Inland Manufacturing Division of the General Motors Corporation. The talk will cover construction and operation of press equipment, product design, mold terminology, and fundamentals of mold design. A round-table discussion of the subject is scheduled to follow presentation of the talk. A sound picture covering a trip through the East St. Louis, Ill., plant of the Midwest Rubber Reclaiming Co. will also be shown.

Chicago Holds Golf Tourney

An interesting golf tournament, with prizes to the winners of various events, featured the annual summer outing of the Chicago Rubber Group, held on July 19 at the Acacia Country Club, near Chicago, Ill. Approximately 185 members and guests attended the outing. In the golf tournament, J. T. Adams, of Sears, Roebuck & Co., and L. B. Wagner, of the Metropolitan Golf Ball Sales Co., were tied for low gross. Other players who won prizes for low gross were C. Skuza, W. Crumpler, S. Lillis, L. Lohuis, and A. Stein. Low net prizes were awarded to F. S. Frost, E. Taylor, C. K. Novotny, W. M. Kane, and H. B. Taylor. Dwight E. Smith served as chairman of the Outing Committee.

Quebec Holds Golf Tournament

Approximately 60 members and guests attended the third annual golf tournament of the Quebec Rubber and Plastics Group, held on July 18 at the Granby Golf and Country Club at Granby, Quebec, Canada. Despite inclement weather in the early part of the afternoon, the golf tournament was considered a most successful one. A series of short speeches were presented at a dinner which followed the tournament. Stuart A. McLean was chairman of the Golf Committee.

OMD Rubber Division Moves

The Rubber Division of the Office of Materials Distribution of the Department of Commerce is now located on the second floor of Temporary Building "K" in Washington, D. C. Temporary Building "K" is located off 17th Street, between Constitution Avenue and the Tidal Basin. One side of the building faces the Lincoln Memorial Reflecting Pool. Another landmark is the John Paul Jones Monument. The new telephone number is Executive 4340.

LOS ANGELES NEWS

Production of synthetic rubber at the government-owned plant at Torrance, Calif., operated by the synthetic rubber division of the U. S. Rubber Co. was stopped on July 11. As ordered by the Reconstruction Finance Corporation, the plant will be maintained in standby condition with the exception of the chemical unit which will be maintained for another month or so.

The R.F.C. order ended a four-year record of synthetic rubber production on the Coast. Production was started in 1943 when six companies put into operation the 73,000,000 pound project designed to supply Pacific Coast rubber manufacturers with their synthetic rubber needs. It is reported that the unit operated by U. S. Rubber achieved the highest over-rate production in the huge government system, producing rubber at 140% of the original designed capacity.

The most grueling road test for Voit camelback ever contrived by the W. J. Voit Rubber Corporation consists of that company's current sponsorship of a midget racing car in the weekly midget auto races in this area. Rolling on stock recaps fashioned from the company's "Invincible" truck type camelback, Lou Foy, veteran racing driver, each week "tools" his Offenhauser racer around both dirt and asphalt ovals at speeds frequently over the 130 m.p.h. mark. Mr. Foy has frequently brought the "Voit Rubber Special" home in the money.

Assets of the Sierra Rubber Co., Inc., recently adjudged a bankrupt, and evaluated at $465,000, were sold at public auction on June 23. Total receipts at the sale amounted to $185,000. According to the receiver, there were no large individual purchasers of the various machinery and equipment offered, the real assets being sold piece by piece to several local rubber manufacturers and equipment dealers.

The future is bright for the recapping business according to H. L. Kincade, manager of Camelback and Repairs Material for the United States Rubber Company's U. S. Tire Division.

Mr. Kincade, who is on a survey of the Pacific Coast, pointed out that 8½ million tires will be recapped this year as against a 1940 volume of 5½ million. The necessity of wartime recapping proved the economy and safety of the process to motorists who before questioned its worth.

The present tour is the tire expert's first return to the Pacific Coast since he was transferred to New York on his present assignment. He held the same regional position in the West for many years in the department he now heads up.

A two-week vacation has been scheduled for all Firestone factory employees in Southern California effective August 15th. During that time the factory power system will be converted from 50 to 60 cycles.

The Arrowhead Rubber Co., Los Angeles, has announced the appointment of Fred Case as Factory Manager. Mr. Case was formerly factory manager of the Essex Rubber Co. and the Dural Rubber Co.

J. C. Ballagh (Patterson-Ballagh) has returned from an interesting business and pleasure trip to England and continental Europe. It is expected that Mr. Ballagh will recount his experiences at a future meeting of the Los Angeles Rubber Group.

The following have been welcomed as members to the Los Angeles Rubber Group: J. A. Bearce (Caram), Norvin Kennedy (Products Research), Homer Neptune (Arrowhead), M. E. Lerner (RUBBER AGE), L. E. Peterson (Goodyear), and R. R. Reese (American Anode).

Chlorinated Styrene Rubber

General Tire & Rubber Co., Akron, is reported to have developed a chlorinated styrene rubber which is believed to match the qualities of natural rubber more closely than any other synthetic yet developed. In actual tests, tires made with the new polymer are said to show less sidewall cracking, better heat resistance and longer wear than those made from standard GR-S. The new synthetic, still in the experimental stage, is believed to be an outgrowth of research on chlorostyrenes undertaken jointly with the Mathieson Alkali Works.

Armour to Build New Plant

Plans for the construction of a new chemical plant in Chicago, Ill., at an estimated cost of several million dollars have been announced by Armour & Co. The new plant will include additional facilities for the production of fractionated fatty acids, known commercially as Neo-Fats, and the manufacture of many new chemicals derived from fatty oils and fats. Building operation will begin shortly and it is expected that the plant will be in partial operation during the early part of 1948 and entirely completed by the end of that year.

Monoplex 11 and Monoplex 16

Two new plasticizers, known as Monoplex 11 and Monoplex 16, which are said to be compatible with such elastomers as neoprene, the nitrile rubbers, and polyvinyl butyral, and in film formers such as cellulose aceto butyrate, have been developed by the Resinous Products & Chemical Co., *222* West Washington Square, Philadelphia 5, Penna. Monoplex 11, the dialkyl ester of a synthetic long chain dibasic acid, is said to display outstanding plasticizing efficiency in polyvinyl chloride stocks, with good low temperature and ultra-violet resistance properties at much lower volatility than is usually found combined with such excellent solvating action. Stocks plasticized with Monoplex 11 are claimed to have excellent hand and drape. Monoplex 16, a high molecular weight nitrile plasticizer, is reported to yield polyvinyl chloride stocks of superior heat and ultra-violet stability, outstanding permanence, good low temperature flexibility, and extremely low water sensitivity.

Patents Made Available

Approximately 2,000 patents owned by the United Shoe Machinery Corp., 140 Federal St., Boston 9, Mass., have been placed on the Register of Patents of the Patent Office, U. S. Department of Commerce. By this action, the company makes these patents available to other concerns and individuals on a non-exclusive licensing basis and on terms to be agreed upon. A large number of the patents relate to shoe manufacturing and repair. A booklet containing abstracts of the patents is available without cost from the company.

Report on Tires and Tubes

A report which traces the development of the tire and tube manufacturing industry in the United States for the past twenty-five years has been made available by the U. S. Department of Commerce. Entitled "Rubber Tires and Inner Tubes," the report covers the production and performance of tires and tubes from 1910, when the first pneumatic tire was introduced, through 1946. Copies of the report may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., for five cents.

Rayon Cord in Fan Belts

Rayon cord, similar to that being used in bus and truck tires, is now being used in fan belts for automobiles, refrigerators, deep freezers, and air conditioners, according to the American Viscose Corp., 350 Fifth Ave., New York 1, N. Y. Accelerated tests conducted by a rubber manufacturer are said to indicate that fan belts made with continuous filament, high-tenacity rayon cord last 50% longer than other belts in some types of service.

TECHNICAL REPORTS AVAILABLE FROM THE DEPARTMENT OF COMMERCE

Data on additional reports on industrial and technical developments which occurred throughout the world during the wartime period are listed below. This information is taken from the "Bibliography of Scientific and Industrial Reports," issued by the U. S. Department of Commerce, and copies of the reports listed may be secured, at the prices indicated, from the Office of Technical Services, Department of Commerce, Washington 25, D. C. Remittances made payable to the Treasurer of the United States must accompany order. Titles of the more recent reports follow:

Analysis of GR-S Latex by Light Scattering. By P. P. Debye. Issued by the Office of the Rubber Director, this report contains photographs, diagrams, tables and graphs.—Report No. PB 9683. 58 pp. Photostat, $4; Microfilm, $1.

Procedure for the Characterization of Raw GR-S Polymers. By G. E. Hulse and others. The paper gives accepted standard apparatus and standard procedures for the performance of three tests on raw GR-S. It further states the formulas by which the intrinsic viscosity can be deducted from the relative viscosity of the solution and shows how the approximate molecular weight can be calculated.—Report No. PB 9677. 11 pp. Photostat, $1; Microfilm, 50c.

Volume Swell Properties of Freeze Resistant Synthetic Rubbers. By P. J. Mahoney. Test results on Thiokol FA, Hycar OR, Perbunan and Neoprene ILS are presented.—Report No. PB 9810. 3 pp. Photostat, $1; Microfilm, 50c.

Method for the Determination of Butadiene During Emulsion Polymerization. Method for the Determination of Free Styrene During Emulsion Polymerization. By E. J. Meehan and I. M. Kolthoff. Experiments sponsored by the Office of the Rubber Director are described.—Report No. PB 9674. 8 pp. Photostat, $1; Microfilm, 50c.

Conversion of Aircraft Tires to Synthetic Rubber Construction. By Lewis V. Coursen. Report on conference, held in Akron, Ohio, on July 9, 1943.—Report No. PB 10104. 2 pp. Photostat, $1; Microfilm, 50c.

Method of Preparing Artificial Rubber. In German. Patent application by I. G. Farbenindustrie for the preparation of synthetic rubber by polymerizing a mixture of isoprene and a vinylethinylallsylcarbinol in the presence of small amounts of acrylonitrile and methacrylonitrile in aqueous solution. Enlargement print of part of Microfilm 185-1.—Report No. PB 19351. 4 pp. Photostat: $1; Microfilm, 50c.

Method of Preparing Soluble Artificial Rubber. In German. Patent application by I. G. Farbenindustrie. Enlargement print of part of Microfilm 185-1.—Report No. PB 19318. 3 pp. Photostat, $1; Microfilm, 50c.

United States Rubber Plastic. By Dale V. Bremerman. The object of the work described in this report was to make mechanical and physical tests of a combination plastic of canvas bonded to impregnated paper, developed for use in gasoline tank shells.—Report No. PB 6442. 6 pp. Photostat, $1; Microfilm, 50c.

Manufacture of Hard Rubber Parts for Storage Batteries and Battery Ventilating Equipment for German Submarines. By S. P. Fisher.—Report No. PB 6675. 26 pp. Photostat, $2.

Japanese Rubber Coat. By Wilbur S. Russell and others. Results are given of vesicant penetration tests on a rubber coat found in Burma in 1945.—Report No. PB 28400. 5 pp. Photostat, $1; Microfilm, 50c.

Japanese Type 98 Electrical Protective Suit. By Wilbur S. Russell and others. Description of a Japanese heavy rubber suit and mittens.—Report No. PB 28406. 9 pp. Photostat, $1; Microfilm, $1.

Continental Gummiwerke A. G. Hanover. By S. J. Stedman and others. Report on a visit to the company's three plants in Hanover, Germany.—Report No. PB 28949. 15 pp. Photostat, $1; Microfilm, $1.

General Summary of Production and Use of Reclaimed Rubber in Germany. Issued by U. S. Rubber Bureau and U. S. Office of Rubber Reserve.—Report No. PB 28310. 10 pp. Mimeograph, 10c.

German Medical, Surgical, and Sundry Rubber Goods. Issued by U. S. Rubber Bureau and U. S. Office of Rubber Reserve. Report covers visits made to the Continental plant in Hanover, the Phoenix plant in Harburg, and the Dunlop plant in Hannau.—Report No. PB 28337. 27 pp. Mimeograph, 25c.

German General Rubber Goods Industry. By S. A. Brazier and others. Manufacturing techniques at a number of German plants reported.—Report No. PB 23858. 263 pp. Photostat, $18; Microfilm, $3.

Antioxidant 4010. In German. Presents test results of material which replaces in whole or in part the use of phenylbetanaphthylamine and diphenyl-p-phenylenediamine. Enlargement print of part of Microfilm 185-2.—Report No. PB 1740. 9 pp. Photostat, $1; Microfilm, 50c.

The Development of the New Styrene Catalyst. By Office of Rubber Reserve. Translation of a review prepared for the Buna Meeting of July 29, 1944. Covers experiments undertaken during 1940 in the styrene laboratory "Lu" of the I. G. Farbenindustrie, at Ludwigshafen-on-the-Rhine, Germany. — Report No. PB 13363. 12 pp. Photostat, $1; Microfilm, 50c.

Army-Navy Packing Specifications AN-HH-P-114. By E. M. Polk. Problems in relation to the new specifications are clarified for manufacturers of aircraft hydraulic packings. — Report No. PB 16611. 9 pp. Photostat, $1; Microfilm, 50c.

Manufacture of Buna Rubber. . By Technical Industrial Intelligence Committee. Describes the manufacture of Buna-S-3 at the Ludwigshafen, Germany, plant of I. G. Farbenindustrie. — Report No. PB 13341. 6 pp. Photostat, $1; Microfilm, 50c.

Final Report of Government Tests "K," Nos. 28 and 207, Ordinary Cotton, "Wilds" Variety Cotton, and Rayon Cords in Tire Carcasses. By Office of Rubber Reserve. Supplementary to PB 2921. Photographs show results of tire and tube tests. — Report No. PB 22263. 44 pp. Photostat, $3; Microfilm, 50c.

Test N-285: 90% Synthetic Experimental Cotton Fabrics; 750-20 M & S; Final Report. By U. S. War Department. Results of tests conducted by the Ordnance Tire Test Fleet at Normoyle Ordnance Depot, San Antonio, Texas, to compare general service durability and treadwear of 90% synthetic experimental cotton fabric tires. — Report No. PB 16105. 36 pp. Photostat, $2; Microfilm, 50c.

Test N-395: 90% Synthetic 8 and 2 Cap Ply Experimental Cotton Fabrics; 7.50-20 M & S; Final Report. By. U. S. War Department. Results of tests by the Ordnance Tire Test Fleet at Normoyle Ordnance Depot, San Antonio, Texas, to compare general service durability and treadwear of 90% synthetic 8 and 2 cap ply experimental cotton fabric tires. — Report No. PB 16108. 26 pp. Photostat, $2; Microfilm, 50c.

Final Report of Test of Buna S Rubber Taps and Heels. By U. S. War Department. Project T-107 of Quartermaster Board. Wearing qualities of Buna S and standard reclaim rubber taps and heels are compared. — Report No. PB 18410, 4 pp. Photostat, $1; Microfilm, 50c.

Preliminary Report of Test of Buna S Rubber Taps and Heels. By U. S. War Department. Project T-107 of Quartermaster Board. Complete report available in PB 18410. — Report No. PB 13364. 22 pp. Photostat, $1; Microfilm, 50c.

Intrinsic Viscosities. By. F. T. Wall. Deals with the theory of measurement of intrinsic viscosity of the sols. — Report No. PB 9686. 11 pp. Photostat, $1; Microfilm, 50c.

Investigation of Synthetic Rubber Materials at Low Temperatures. By J. I. Wittebort. Results of test to determine the freeze resistance properties of the different synthetic rubbers, and the effect of oil and gasoline immersions on synthetic rubbers. — Report No. PB 16285. 7 pp. Photostat, $1; Microfilm, 50c.

OBITUARIES

Joseph F. McLean

Joseph F. McLean, founder and president of the Pequanoc Rubber Co., Butler, N. J., died in the Paterson General Hospital in Paterson, N. J., on July 18 after an illness of several weeks. He was 80 years old.

Born in New York City in 1867, Mr. McLean went to Butler in 1884 and started to work as a shipping clerk for the Butler Hard Rubber Co., now the

The Late Mr. McLean

American Hard Rubber Co. He rose to assistant plant superintendent with that company, becoming a director in 1929. In 1901 he helped found and became president of the Pequanoc Rubber Co., manufacturers of reclaimed rubber, serving in that capacity until his death. An active member and one of the founders of the Rubber Reclaimers Association, Mr. McLean was well-known and respected throughout the rubber industry, both in this country and abroad.

For many years he was active in public affairs, having served as Morris County Collector from 1897 to 1918, Butler Councilman from 1909 to 1917, member of the Butler Boro Sinking Fund Commission from 1928 to 1946, and Mayor of Butler from 1919 to 1920. He was a director for many years of the First National Bank of Butler and a director of the Vulcanized Rubber and Plastic Co., Morrisville, Penna.

Mr. McLean's charities were widespread and he was always giving a helping hand to every cause or individual needing assistance. He was a Mason, an Odd Fellow, and a Rotarian. A widow survives.

Charles M. Wernig

Charles M. Wernig, vice-president and sales manager of the Eclat Rubber Co. and the R. C. A. Rubber Co., died suddenly at his home in Akron on July 27 at the age of 48. Mr. Wernig suffered a heart attack in Cleveland, Ohio, on July 22 and was brought to his home where he appeared on the way to recovery when he suffered a fatal attack. Born in Austria, Mr. Wernig was brought to America at the age of four. He completed his education at the University of Wisconsin at Madison, Wisc. Joining the Firestone Tire & Rubber Co. in 1921, he was promoted to assistant sales manager seven years later. In 1932 he joined the Eclat and R. C. A. organizations. He was a member of the Portage Club and the Akron Kiwanis Club. He also belonged to the Holy Name Society of St. Sebastian's Church in Akron. A widow survives.

J. Clifford Mills

J. Clifford Mills, assistant to the sales manager of the Footwear Division of the Dominion Rubber Co., Ltd., with headquarters at the Montreal offices, died recently in his forty-sixth year. He was associated with Dominion Rubber for 27 years. Born in Montreal, Mr. Mills joined Dominion Rubber in 1920 and progressively moved through footwear production and sales, merchandising, style and design, etc. During World War II he assisted in formulating an equitable distributing system as a result of which Canadians were provided with ample footwear despite the severe shortage. Hunting was his strong forte, although he was also extremely interested in fishing and golf. A widow and two sons survive.

Robert D. Hassler

Robert D. Hassler, production superintendent of the mechanical goods division of the General Tire & Rubber Co., and associated with the rubber manufacturing industry for some 52 years, died at his home in Wabash, Indiana, on August 6, following a heart attack. He was 66 years old. A native of Akron, Mr. Hassler was connected with the B. F. Goodrich Co. and its subsidiary, the Miller Rubber Co., until he joined General Tire in 1934. He developed the mechanical goods division of the company and in 1937 joined Howard Dodge in establishing the company's mechanical goods plant at Wabash. Mr. Hassler was a member of Akron Lodge 83, F. & A.M., Washington Chapter 25 and Council 80. A widow and daughter survive.

Fred F. Slack

Fred F. Slack, chief chemist of the Corduroy Rubber Co. for the past eighteen years, died in Grand Rapids, Mich., on July 30 following a six-month illness. He was 53 years old. A graduate of Oberlin College, Mr. Slack was employed in the laboratory of the Miller Rubber Co. for four years and as chief chemist of the Cooper Tire & Rubber Co. for nine years before joining Corduroy Rubber. He was a member of the Park Congregational Church and the Torch Club in Grand Rapids. A widow, two daughters and a son survive.

Additional Barrett Report

The Barrett Division of the Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y., has issued another of its new series of rubber laboratory reports. Designated as Rubber Laboratory Release No. 6, this latest report emphasizes the use of Carbonex tar hydrocarbons as aids in the processing of calendered and extruded stocks. The effects of progressive additions of Carbonex to a basic GR-S-EPC channel black compound are shown. Copies of the report are available on request to the company.

Bureau Files OTS Abstracts

Consultants Bureau, 153 West 33rd St., New York 1, N. Y., has announced that abstracts of over 500,000 reports which have been published in the weekly *Bibliography of Scientific and Industrial Reports* issued by the Office of Technical Services, U. S. Department of Commerce, are on file at its offices, both by subject matter and numerically. Industrial firms, librarians, professionals and students may use this file for their own research without charge, by appointment only.

New List of Rubber Publications

The National Bureau of Standards, Washington 25, D. C., has issued a new and revised list of publications relating to rubber by members of the staff of the Bureau. The list covers the period from the founding of the Bureau to June 30, 1947. The new list is contained in Letter Circular LC869, which supersedes LC707. Copies of the new letter circular are available from the Bureau on request.

Appointed West Coast Agent

Los Angeles Oil & Grease Co., 1333 Willow St., Los Angeles, Calif., has been appointed West Coast sales agent for the rubber processing aids manufactured by the Sun Oil Co. Among the Sun products which will be marketed by the Los Angeles organization are Circo Light Process Oil and Circosol-2XH.

CANADIAN NEWS

According to a report issued by the Polymer Corporation for the year ending March 31, 1947, approximately 75% of the company's sales were from GR-S, the average selling price of that rubber for the period covered having been 19.6 cents a pound. The report frankly admits that "from now on it will be extremely difficult to market large quantities of GR-S."

Net profit for the year amounted to $3,800,000, after deducting selling and administrative costs of $531,000, including $160,000 applicable to imported rubber operations which the company carried on for the government, and $375,000 for salaries and expense on research and development. Operating profit amounted to $4,300,000, plus $238,000 on trading in imported rubber. Total sales amounted to $22,500,000, consisting of the following: GR-S, $16,800,000; butyl, $5,000,000; styrene, $640,000; steam, electricity and water, $41,000.

Total cumulative profits since Polymer began operations amount to $8,600,000, about 45% of which was made in the 1946-47 period. In the two previous fiscal years, profit of $2,600,000 and $2,500,000, respectively, was shown. In the 1943-44 period, the first year of operation, there was a loss of $336,000.

The cumulative surplus account shows the company has written off $967,000 as "portion of administrative expenses capitalized during the period of plant construction commencing February, 1942." It has written into its accounts $2.8 millions of reserves no longer needed in respect of crude and imported rubber purchases. An almost similar amount has been deducted for depreciation of plant, equipment, etc. There has been a further write-off of $3.8 millions shown as "distribution of profits" to the Government. This leaves a net surplus transferred to the balance sheet at the end of the year of $3.9 millions.

The latest balance sheet shows total assets of $49.7 millions of which $38 millions is the depreciated values of land, buildings, equipment, etc. A footnote appended to the statement states that: "Depreciation is chiefly computed on cost reduced by abnormal wartime costs of construction." It estimates this abnormal cost at $22 millions. Since only half of this has been written off, the comment is made that "The balance sheet valuation is overstated to the extent that abnormal wartime construction costs are included or the deduction for depreciation is based on less than original cost."

This is the point referred to in no uncertain terms by Auditor-General Watson Seller when speaking before the Public Accounts Committee recently. He expressed the view that Polymer should be put through the financial wringer and its accounts established on a basis which would show the true picture of its operations. Said Mr. Seller: "We cannot set up a depreciation account because Polymer doesn't own the property. There should be set up a proper depreciation account so that you could see at a glance what is the true situation and I would be much happier."

The rubber industry in Canada is producing to capacity today and selling all it can make, according to a rubber authority. There may be some slackening off towards the end of this year, the authority thought, as inventories approach normal for the first time since 1939.

No difficulty is being encountered in obtaining rubber, but some shortage of textiles remains in evidence. While the industry is returning gradually to natural rubber, the possibility of a complete return is questionable. "The synthetic product seems to have earned a place," said one official, "but it has yet to find that place. A certain amount of synthetic rubber will be used indefinitely," he added.

Because the industry was upset four months last year with strikes, this official declared, it would be hard to compare business today with that of 1946.

"Our volume is a little larger than last year," said C. C. Hoag, general manager of the Dayton Rubber Co., "but the buying for inventory is smaller. People all over are attempting to cut down because of the unsettled price conditions today and so order only for current needs."

As makers of general molded mechanical goods, children's play balls and other inflated goods, the company thinks the outlook is very good in the rubber industry. "There is every evidence of continued volume in domestic buying," Mr. Hoag declared, "and a strong increase in the export market."

Declining to "go out on a limb" regarding prices, the executive said any general change depended on the labor market. "If the cost of labor increases, then the price of the product will go up," he stated, "but on the other hand, any decrease in production costs will be passed on to the consumer."

Revealing some materials were still difficult to obtain, Mr. Hoag said white rubber pigments and certain types of reclaimed rubber belonged in this category. "The production potential of white rubber today is not nearly enough to meet the demand," he explained, "while the reclaimed product is beginning to get in short supply due to the continued lack of natural rubber."

G. R. Bellinger, sales manager of the Barringham Rubber and Plastic Co., Oakville, Ont., said the public is asking for quality merchandise today and to continue to manufacture high-grade articles, his company was constructing a new $750,000 addition to their plant. This is the second addition in two years, and will be used for making plastic material and coated plastic fabrics.

"If we had more fabrics, we would be in a better position to increase our business over last year," declared Mr. Bellinger, whose company manufactures garden hose and rubber clothing. He said their volume had not been as large as last year, but "fortunately we have been blessed with some nice business from England."

The recent appointment of William Ralph Walton, Jr., as assistant general manager of Dunlop Tire & Rubber Goods Co., is another example of industry and ability bringing its own reward.

Born in Toronto in December 1903, quiet, unassuming Bill Walton was educated at Rosedale Public School, University of Toronto Schools, and the School of Practical Science, University of Toronto.

On graduating in 1924, he joined the paint and varnish division in Toronto of Candian Industries Limited. Early in 1922 Mr. Walton was sent west to be in charge of the Regina plant where he remained until late in 1931.

With the assumption of a more active part in the Dunlop management by C.I.L., Mr. Walton was transferred to Dunlop Tire. After a few months during which he acted as assistant to J. I. Simpson, he was appointed works manager in the middle of 1932. In March, 1940, he was elected a director and this year appointed assistant general manager.

In April, 1939, Mr. Walton was elected a director of Canadian Lastex Limited, which is 50% owned by Dunlop.

Price reductions ranging from $14 to $50 have been made in farm tractor tires sold in Vancouver and elsewhere in Canada. H. J. Morrow, divisional manager, Firestone Rubber and Tire Co. of Canada, Ltd., said the price cuts are now in effect.

The most popular size of tractor tire, the 10 to 28, is down $14 from $70.95 to $56.95. Tubes for this tire were $14.15, but are now $12.05, a reduction of $2.10.

Mr. Morrow said that in one or two of the biggest tractor tires, prices have been lowered as much as $50 to the tractor owner.

The election of L. R. Leaver as president of the Joseph Stokes Rubber Co., Ltd., Welland, Ontario, subsidiary of the Thermoid Co., has been announced. Mr. Leaver has been vice-president and a director of the company, and under his leadership during the past eight years sales of the company have increased from less than $1,000,000 per year to approximately $4,000,000 for the year of 1947.

CANADIAN NEWS—Cont'd

No early price cut in tires is foreseen by Canadian makers and dealers following recently announced reductions in prices of natural and synthetic rubber. Several major U. S. makers have cut tire prices substantially in the last few weeks but, the trade here says, the Canadian position is different: U. S. prices have been hiked several times since 1940 while Canadian prices stood still.

Other factors cited as more than offsetting the Canadian rubber price saving included:

1. Last year's lengthy, costly "general" strike still seen in the bottom-of-the-barrel inventories here; the American inventory position is much better.
2. Rayon cord costs much higher than in the United States. Cotton up steeply as raw cotton at 36c a pound, almost triple the pre-war price.
3. Labor wages up sharply since 1945 while labor productivity is said still at all-time low level.
4. Production costs generally much higher in Canada than United States, where capacity per plant is much greater and more specialized.

Paul M. Irwin, manager of special brand sales and the tire engineering and service department of the Tire Division of Dominion Rubber Co., Ltd., was recently decorated with the M.B.E. by His Excellency the Governor General of Canada, with whom he was associated in action during the war. Mr. Irwin served with the Canadian Active Army, with the R.C.A.S.C., and with the R.C.O.C., rising from the rank of major to lieutenant colonel.

Dominion Rubber Co. which has its head office in Montreal, recently was advised by the Quebec Association for the Prevention of Industrial Accidents, that all of the six plants which it operates in Quebec had completed the month of June without a single lost time accident. The six plants concerned were the Mechanical Goods Papineau Factory, Latex and Reclaim, Montreal Footwear Factory, Canadian Lastex, Ltd., all of Montreal, and the Leather Shoe and St. Jerome Footwear factories, of St. Jerome, Quebec. Each plant received a special certificate.

The Toronto Stock Exchange recently approved the listing of an additional 50,000 four per cent cumulative redeemable sinking fund preferred shares of Goodyear Tire & Rubber Company of Canada, Limited, and the shares were to have been posted for trading at the opening on Friday, Aug. 1. This brings total listing to 257,260 common and 160,000 preferred shares.

A rapid oversubscription was reported of an offering of an additional 50,000 4% cumulative redeemable preferred shares, par $50, of Goodyear Tire & Rubber Company of Canada by A. E. Ames & Co. The stock represented the remaining authorized but unissued preferred shares. The offering price was $52.50 a share to yield about 3.81%. Proceeds of the issue will be used for the general corporate purpose of the company, it is stated.

Goodyear has recently extended its facilities by acquisition of additional premises, including a plant in Quebec which, when equipped with the necessary machinery, will be used for manufacture of miscellaneous rubber products. In addition, two new factories are now under construction in New Toronto, to be devoted to the manufacture of "Airfoam" and "Pliofilm" products.

The building occupied by the Goodyear Tire & Rubber Co. of Canada, Ltd., on Richmond Street in Toronto has been purchased by the Canadian Oil Companies. Goodyear last fall purchased a building on Fleet Street and will occupy it in the near future, using it as head office for its Toronto branch, for certain executive offices, and for local warehouse space.

Operation of the cold room of the new Butyl pilot plant at Sarnia was expected to get started this past month. Completion of the remainder of the building is scheduled for the near future. The building, which will be 83 feet long by 31 feet wide, will be of steel and concrete block construction. It will be devoted to specialized research and broad experimentation in the Butyl field.

Index to Technical Problems

A "Bibliography and Index" covering some 2500 reports of research on wartime technical problems sponsored by the Office of Scientific Research and Development has been published by the Office of Technical Services of the Department of Commerce. The items listed comprise all the numbered reports published by OSRD between 1941 and 1945 which are no longer held confidential in the interests of military security. Orders for the "Bibliography and Index" (PB-78000, OSRD Reports, Bibliography and Index, multilith copy, 109 pages, 75c) should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order made payable to the Treasurer of the United States.

Brazil Doubles Tire Production

Tire production in Brazil has doubled since the period immediately prior to World War II, according to the Brazilian Government Trade Bureau. The current annual output ranges between 700,000 and 800,000 units, while production before the war amounted to approximately 400,000 units a year. Although the demand for tires has increased by nearly 100%, the number of cars in Brazil has diminished slightly. The increased consumption of tires in the face of fewer cars in operation is explained by the fact that motor vehicles are carrying heavier loads and traveling longer distances, thereby accelerating the wear and tear on tires. Shortly before the war there were about 225,000 vehicles in Brazil, of which approximately 125,000 were passenger cars, according to the Bureau. At that time, tires were replaced at the rate of a little more than two per year. Currently, however, annual tire replacement has increased to four units per year.

Conductive Rubber Flooring

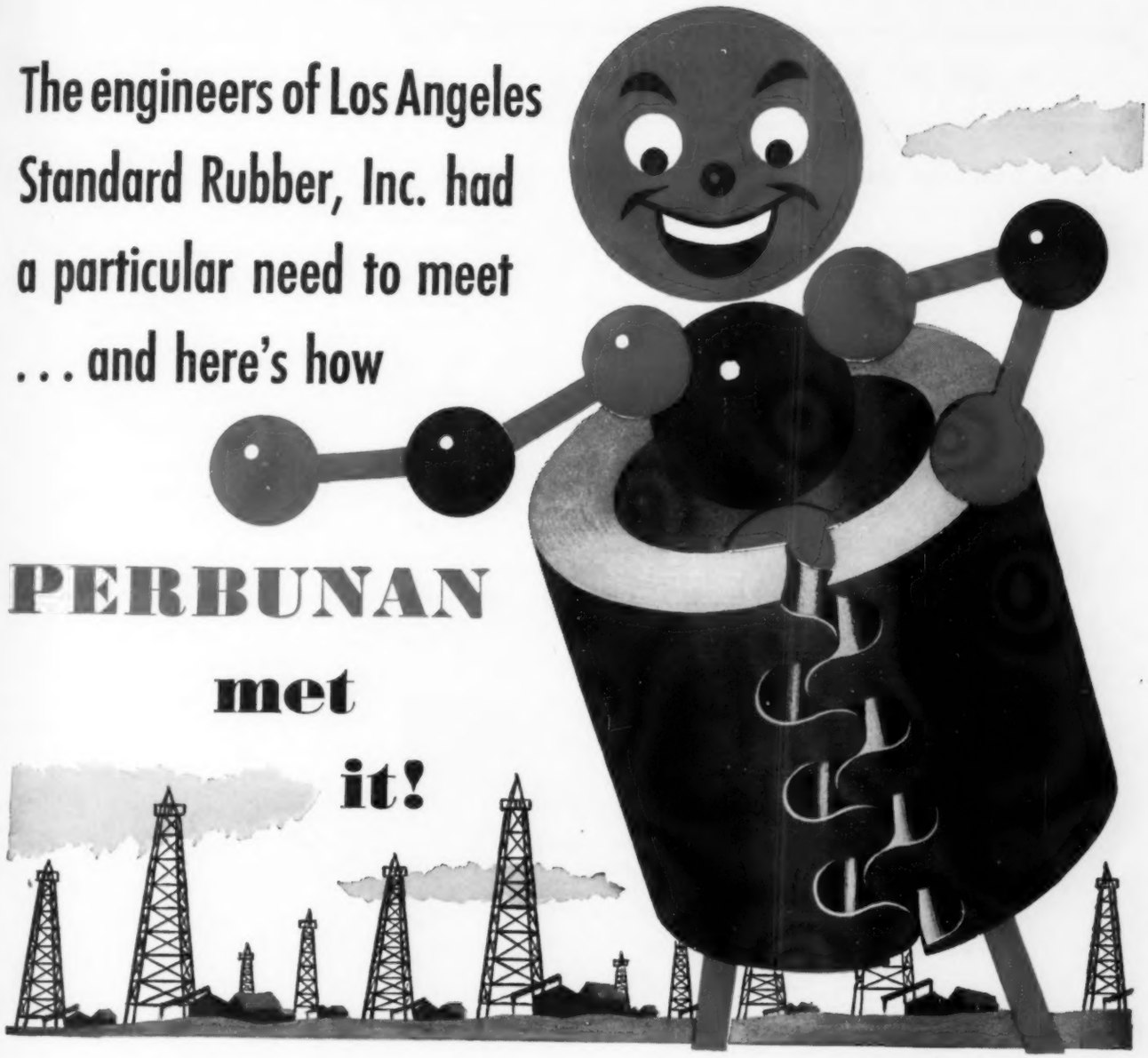
Static conductive and spark resistant rubber flooring, which is said to be specially adaptable to hospital surgical departments, has been made available by the Goodyear Tire & Rubber Co., Akron. Black in color, the flooring material is impregnated with fine wires running parallel throughout the length of each strip of material, one in the center and two others spaced twelve inches on each side of the center wire. The longitudinal wires are connected at each end of the strip with master ground wires, which make the floor a complete, separate electrical unit. Non-conductive cover base and collars insulate the flooring from the walls and from radiator pipes and similar metal. Having a maximum resistance of 250,000 ohms, the flooring may be installed on old and new concrete and wood bases on or above grade.

Reduces Price of Latex 512

A price reduction for Latex 512, a styrene-butadiene latex, of approximately 13% in drums and 21% in tank cars has been announced by the Dow Chemical Co., Midland, Mich. Under the new price schedule, Latex 512, which is used as a binder in fine paper coatings and as an adhesive in leather, textiles, and book bindings, will be sold for 26½ cents per pound, l.c.l., drums; 26 cents per pound, c.l., drums; and 23 cents per pound in tank cars, f.o.b., Akron, Ohio, or Naugatuck, Conn.

Wilmington Chemical Corp., South Heald St., Wilmington, Del., has made available a new technical bulletin treating with the use of Wilmac R as a substitute for stearic acid in GR-S stocks, where the requirements are faster cure and flat modulus.

The engineers of Los Angeles Standard Rubber, Inc. had a particular need to meet . . . and here's how



PERBUNAN met it!

The "particular need" was this: a material had to be found for Super-Lock Gland Packings that would stand up under the *extra-tough* service of oil-field work...would permit *precision* fabrication into the unique design developed for quick installation...and have remarkable *resistance* to heat, oil, water and frictional wear.

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A NEW STABILIZER has now been added to Perbunan that also allows it to be used in a wide variety of colored articles...especially where delicate colors are used...and where discoloration of the rubber part or the material would be objectionable.

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NEW RUBBER GOODS

No. 140 Series Shock Absorber

A new type of shock absorber utilizing rubber has been introduced by the Vibration Eliminator Co., 10-28 Forty-seventh

Ave., Long Island City 1, N. Y., for slow speed or low frequency machines. Known as the No. 140 Series Shock Absorber, it is claimed to possess relatively great static deflection. Available for loads between 100 and 400 pounds, it is said to secure a static deflection of as much as one-half inch. The absorber is reported to have a high isolation efficiency for operating frequencies as low as 600 c.p.m.

Inflatable Rubber Ball

A large seamless inflatable rubber ball, designed for sports as well as for beach use, has been introduced by Molded Latex Products, Inc., 27 Kentucky Ave., Paterson, N. J. Called the Joyball, the ball is molded in one piece by the patented Kaysam process. It is said to be

easy to inflate, with no special tools or inflating devices needed. After inflation of the ball, the valve pops into a recess flush with the surface of the ball, leaving no dangerous projections on the surface. Fourteen inches in diameter, the ball is available in orange, blue or yellow. A smaller ball, known as Joyball, Jr., which is eight inches in diameter, has also been made available by the company for the younger child.

Gerry Nufoam Shoulder Pads

Shoulder pads made of foam rubber have been placed on the market by the E-Z Thread Co., New York, for use in dresses, suits, coats, and blouses. Molded in one piece of Koylon foam rubber by the U. S. Rubber Co., the shoulder pads are covered with rayon taffeta and distributed under the name of Gerry Nufoam by the E-Z Thread firm. The pads are said to be cool and comfortable, as well as very light in weight. Other advantages are that they are washable, retain their shape, and do not mat down, lump, or sag. Available in black, white and navy blue, they are reported to last indefinitely and can be easily transferred from one garment to another.

Speedi-Spout Rubber Plug

Meco, Inc., 1618 North Vancouver Ave., Portland, Oregon, has introduced a new rubber spout and faucet which can be fitted to the standard plugs of drums

or barrels. Known as the Speedi-Spout, it can be fitted to drum or barrel by folding or storing inside. Reported to be oil and gas resistant, the rubber plug eliminates the threading of valves or faucets into the barrel bung. Moving the plug in or out adjusts the flow of liquid from the barrel or drum.

Plastile Plastic Floor Tile

A laminated and decorative plastic floor tile, which is said to have excellent sound absorption qualities for installation in stores, churches, hospitals, restaurants, playrooms, and other heavy duty applications, has been developed by the U. S. Stoneware Co., Akron. Called Plastile, the tile is composed of a 3/32-inch layer of vinyl compound bonded to a 3/32-inch resilient base of synthetic impregnated cork. It is available in a wide range of colors in standard tile sizes of 8½ by 8½ and 9 by 9 inches and in sheets 35 by 35 inches, and is said to be resistant to acids, alkalies, oils, greases, abrasion, and any type of cleaning fluid.

National Poochie Dog

A funny-faced toy puppy, molded from neoprene latex, has been introduced by National Playthings, a division of the National Pairpoint Co., New Bedford, Mass. Colored in shaded tones of brown, with a bright red protruding tongue, the

dog is molded in a sitting position and is approximately 5½ inches high. When squeezed, it whistles, an added attraction for children. The colors used are said to be harmless. Each dog, known as the "Poochie" dog, is packaged in a card board box. Clark-Babbitt Industries, Inc., 75 Federal St., Boston 10, Mass., are sales representatives for the item.

Darex 8006 Play Ball

A new inflatable ball designed for active beach and play use has been introduced by the Dewey and Almy Chemical Co., Cambridge 40, Mass. Designated as the Darex 8006 Play Ball, the ball, which features a tuck-in valve stem, is designed for mouth inflation to a thirteen inch diameter. It is made of neoprene and is available in red, blue, or yellow.

Goodrich Koroseal Play Pond

An inflatable play pond for children, made of Koroseal, the company's polyvinyl chloride sheeting, has been placed on the market by the B. F. Goodrich

Co., Akron. Shaped like a doughnut, the pond can be filled with water six to nine inches deep and seven feet wide. The seams of the pond are heat-sealed and the bottom and sides are made extra heavy to stand long use under all kinds of summer weather. There are no frames or metal parts in the pond to injure children.

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8. Control panel contains Volt and Ammeters — Time Meter—Light and Water Cycle switch—Automatic time cut off switch — Voltage adjusting switch — Direct reading thermal regulator — Reactance Coil (cut power cost in half).

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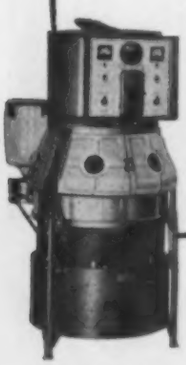

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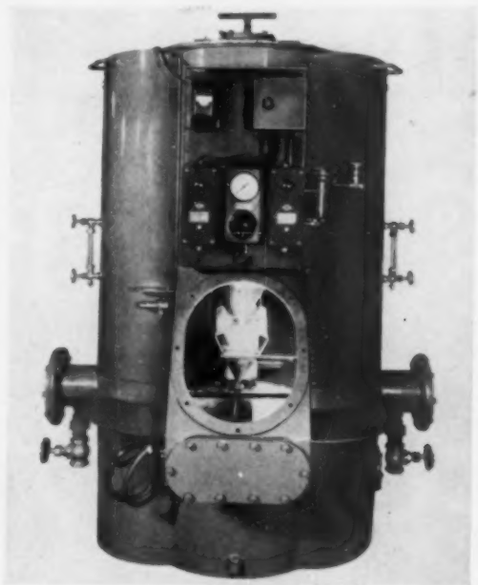
NEW EQUIPMENT

Duster-Deduster for Inner Tubes

The new duster-deduster unit recently developed by the Whittington Pump & Engineering Co., 245 South Meridian St., Indianapolis 4, Ind., is said to represent a forward step in the manufacture of automobile inner tubes. The new unit injects into the tube at the extrusion die a carefully proportioned stream of compressed air and soapstone, this representing the dusting operation. As the tube forms in a continuous length the air slightly inflates it and the soapstone prevents sticking where the sides may happen to touch. Almost directly opposite the dusting point the excess soapstone, which did not adhere to the warm, moist, inner surface of the tube, is withdrawn by vacuum, this action being the dedusting operation.



According to the manufacturer, the Whittington Duster-Deduster completely eliminates the customary messy operation of blowing out a great deal of excess soapstone with a blast of compressed air when the tubes are cut to length. It is said to assure a smooth, even coating of soapstone. In addition, much less soapstone is used and the air is not contaminated.

The accompanying illustration shows the dusting part of the unit. Through the removable cover at the top, soapstone is loaded into a large funnel-shaped hopper. Compressed air is introduced, the amount of pressure being regulated according to the diameter of the tube being manufactured. A series of vibrators feed the soapstone in a knob-regulated, accurately controlled stream. The operator may quickly vary the proportion of soapstone and air from an invisible stream to a blast of almost pure soapstone. This cloud of soapstone is carried through the rubber hose or through piped connections to the extrusion die (or spider) where the tube is formed. The steps and handle shown in the picture facilitate loading the hopper and enable the operator to peer into the hopper through a sight glass on the top.

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U E & F D

REG. T. M.

Silicone News

DC SILICONES

Through use of Silastic, Pratt & Whitney Aircraft engineers save weight and improve performance of new intercylinder assembly designed to drain hot oil from rocker boxes of 3500 h.p. Wasp Major aircraft engine.

SILASTIC* solves another aircraft problem

Pratt & Whitney Aircraft engineers had to design an intercylinder assembly to drain hot oil from the 30 rocker boxes on the underside of the 28-cylinder Wasp Major. They used metal tubing but between the tubing and the rocker boxes elastic connectors were necessary to absorb the relative motion between engine cylinders. The connectors had to stay elastic at temperatures up to 300° F. and in contact with hot oil.

This problem of elasticity at high temperatures has plagued design engineers for generations. Pratt & Whitney aircraft engineers, however, had already solved that problem once with heat-stable, oil-resistant gaskets of Silastic, used by The Connecticut Hard Rubber Company, to seal the 56 rocker boxes of the Wasp Major.

So, working again with engineers of The Connecticut Hard Rubber Company, New Haven, Conn., they designed a new type of intercylinder oil seal. It called for a metal tube sealed to the cylinder by a Silastic seal and spacer assembly. This design saved weight, heat was more easily dissipated through the all-metal exterior of the assembly, and performance standards were improved.

The Connecticut Hard Rubber Company also worked out production methods for obtaining adhesion between the metal and the Silastic 167 used in the body of the seal. Other Silastic stocks, serviceable over a temperature range of —70° to 350° F. continuously—up to 500° F. in intermittent use—are described in leaflet No. V21-1.

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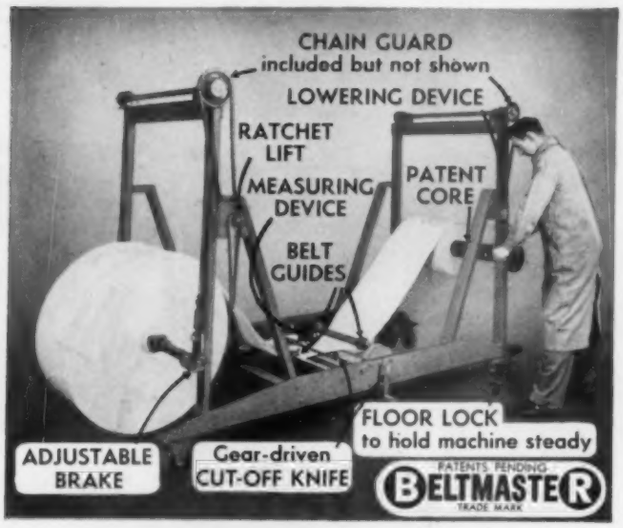
NEW EQUIPMENT (CONT'D)

Belt Measuring and Cutting Machine

A new portable unit which unrolls, measures and cuts off belting at desired lengths, of particular interest to every manufacturer and distributor warehousing and selling large-sized belting, has been developed and introduced by the Ralphs-Pugh Co., 530 Howard St., San Francisco 5, Calif. Called the Beltmaster, this new unit handles belts up to 30 inches wide and 2,000



pounds in weight, although larger capacity machines can be built to meet specific requirements. It is compact, operating in a space of only 12 by 12 feet. Clearance of 62 inches is provided to handle large rolls.

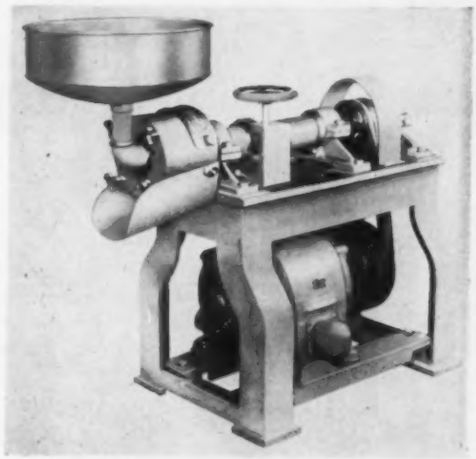
As indicated by the accompanying illustration, the Beltmaster has a number of features, including the following: (1) Ratchet lift and geared lowering devices, both of one-man 2,000 pound capacity; (2) Adjustable brake to maintain tension and keep stock belting rolled tight; (3) Adjustable guides to insure belt winding up true; (4) Geared cut-off knife and powerful holding clamp to cut the belt square and true both as to width and edge; (5) An accurate measuring device to give correct belt length; (6) A collapsible core on which belt is wound, which reduces to smaller size for easy removal when belt is ready for shipment; (7) A floor lock to hold the portable machine steady when operating; (8) Chain guards to protect the operator. A slitting attachment to slit slab stock is also available from the company.

Combining the outstanding features of the Gordon Xactline Control Unit and the Wheelco Electronic Principle Capacitrol, the **Xactline Capacitrol,** a new precision temperature-variation control instrument, has been announced by the Claud S. Gordon Co., Chicago 16, Ill. It is reported to hold tolerances as close as 1/5° F., plus or minus, and power on-off cycles as short as 3 seconds.

A new type of **water-cooled flexible conductor** for transmission of high power, high frequency current has been introduced by Titeflex, Inc., 663 Frelinghuysen Ave., Newark 5, N. J. It is particularly adaptable to high frequency heating equipment or to any equipment where it is necessary to carry a substantial amount of power at high frequency.

Tri-Homo Disperser

A new type of disperser and homogenizer for pigments and other solids in all vehicles, including rubber and latex, has been developed by the Tri-Homo Corporation, Salem, Mass. Called the Tri-Homo Disperser, the unit features a patented triple action providing three passes at the cost of one. This feature



View of the Tri-Homo Disperser

is provided by a close-fitting rotor-stator assembly that gives three dispersing surfaces instead of one. The machine is furnished as a complete, ready-to-run unit. It has a ball bearing enclosed motor mounted underneath, and is supplied with adjustable A or B belts. Other features include thumb screw disassembly for easy and quick cleaning, ready for all colors or materials in a few minutes; water cooled and calibrated adjustment for constant uniformity of product; worm impeller on front of rotor which premixes before dispersing; safe operation, with no moving part exposed; and precision ball bearings, assuring quiet and easy operation.

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FOR FURTHER DETAILS, SEE AD ON PAGE 512

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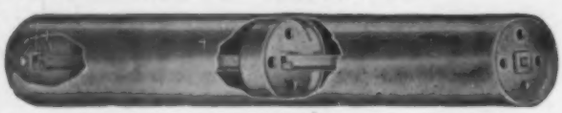

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Cowles Dissolver and Disperser

Operating on a new high-speed principle that introduces components of laminar flow and interface shear, a new dissolver is being manufactured by the Cowles Co., Cayuga, N. Y. Reported to be from two to twenty times faster on standard dissolving and dispersing operations, the new machine exposes broad areas of

molecular contact between the solvent and solute, subjecting the particles of the material being treated to molecular tension and scrubbing action, thus increasing dissolving and dispersing action. High viscosity is said to improve the shearing effect, resulting in faster dissolving or a more homogeneous mixture. Two types of the machine are currently in production. One model has the tank permanently incorporated in the unit with capacities of 100 to 500 gallons. The other model has an elevating head, designed for use with user furnished portable tanks.

A new variable speed, high torque laboratory stirrer, called **Model 77-836 Power-Stir,** especially designed for laboratory use, has been introduced by Eberbach & Son Co., Ann Arbor, Mich. Through 15 to 1 gear reduction the unit is said to develop unusually high torque.

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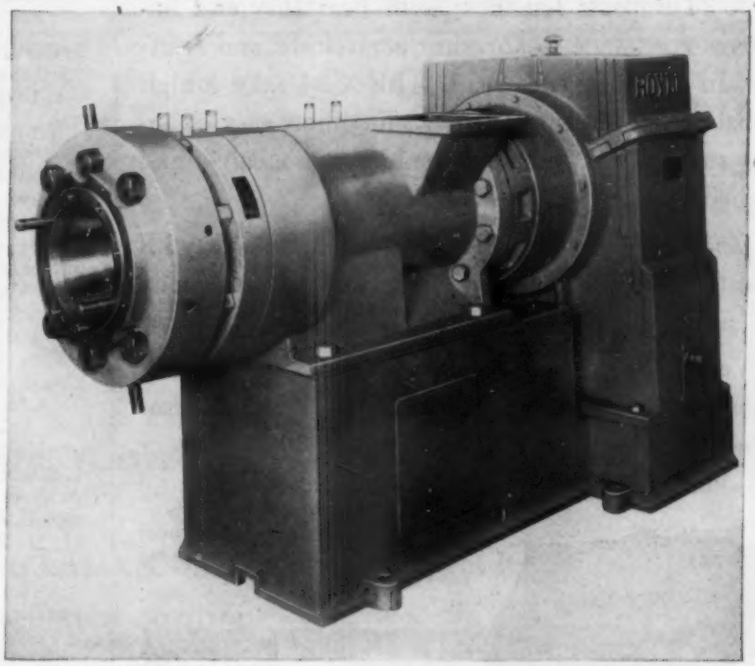

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REVIEWS

BOOKS

Chemistry and Technology of Plastics. By Raymond Nauth. Published by the Reinhold Publishing Corp., 330 West 42nd St., New York 18, N. Y. 6 x 9 in. 522 pp. $9.50.

Although there are several excellent books available covering the chemistry and technology of plastics, particularly the "Handbook of Plastics" by Simonds and Ellis, the book under review is a welcome addition to the technical literature. It is clear, concise and yet comprehensive. The author has left no stone unturned to acquaint his readers with all types of plastics, their properties, their characteristics and their applications. Liberal use is made of photographs and charts throughout the book and, in most cases, a list of reading references appears at the end of the various sections.

The book is divided into five chapters, as follows: (1) Thermosetting Resins; (2) Thermoplastic Resins; (3) Cellulose Plastics; (4) Synthetic Rubber, Natural Resins, and Plywood; (5) Mold Design and Equipment. A glossary of common chemical and technical terms used in the plastics industry is included in the Appendix, which also contains a number of valuable tables. The section devoted to the synthetic rubbers includes a chart giving the properties of these rubbers, as well as of a number of so-called pseudo-rubbers. Incidentally, in discussing thermosetting plastics, the author groups such synthetic rubbers as Buna S, Buna N, neoprene and butyl under the term of "Vulcelastics." A subject index is included.

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Symposium on Plasticizers. Published by Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. 7¼ x 10¼ in. 96 pp. $1.75.

Reproduced from the April, 1947, issue of the *Journal of Polymer Science,* this booklet consists of the seven papers presented at the Symposium on Plasticizers held at the University of Buffalo on June 7 and 8, 1946. The papers, with their authors indicated in parentheses, include the following: Survey of Plasticizers for Vinyl Resins (M. C. Reed); Application of a Mechanistic Theory of Solvent Action to Plasticizers and Plasticization (A. K. Doolittle); Internal Plasticization: The Effect of Chemical Structure (V. L. Simril); Effect of Plasticizers on Second-Order Transition Points of High Polymers (R. F. Boyer and R. S. Spencer); Creep Behavior of Plasticized Vinylite VYNW (W. Aiken, T. Alfrey, Jr., A. Janssen, and H. Mark); Use of Perbenzoic Acid in Analysis of Unsaturated Compounds. I. Preparation and Stability of Solutions of Perbenzoic Acid (I. M. Kolthoff, T. S. Lee, and M. A. Mairs); Use of Perbenzoic Acid in Analysis of Unsaturated Compounds. II. Determination of External Double Bonds in Synthetic Rubbers (I. M. Kolthoff and T. S. Lee).

•

Practical Emulsions (Second Edition). By H. Bennett. Published by Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. 5½ x 8½ in. 568 pp. $8.50.

This completely revised and enlarged edition has been brought up-to-date, with special sections added on the use of soap, lecithin and pectin as emulsifying agents and on surface-active germicides. A symposium on industrial emulsions has also been added, covering the use of emulsions in synthetic latex, leather, polishes, paints, dyeing and coloring. Newly developed emulsion formulae have also been placed in the formula section. The book is now divided into three parts, the first devoted to general information, the second to the symposium on emulsifying agents, and the third to formulas.

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REVIEWS (CONT'D)

Modern Plastics Encyclopedia: 1947. Published by the Plastics Catalogue Corp., 122 East 42nd St., New York 17, N. Y. In Three Volumes. 9 x 12 in. 1,556 pp. Prices: U.S.A., $8.50; Canada, $11.00; Foreign, $12.00.

The latest edition of this comprehensive plastics encyclopedia, the eleventh to be issued, is published for the first time in three volumes Volume I covers the most recent developments and applications for all types of materials, coatings, films, fibers, fabrics, laminates, and resin-woods, and includes a selected bibliography on German plastics. Volume II is devoted to processing problems of all types, and includes complete directories of the plastics industry, covering names and addresses of material and chemical manufacturers, machinery manufacturers, molders, laminators, etc. Volume III is devoted entirely to ten special charts, including one covering the properties of synthetic rubbers, each chart designed to facilitate reference and handling. The directory section, which is part of Volume II, is available separately for $1.00, while Volume III, containing the charts, is available separately for $3.75.

•

Experimenal Casting Plastics. By Thomas A. Dickinson. Published by Plastics Research Co., Alhambra, Calif. 5½ x 8½ in. 24 pp. plus. $2.00.

Small in size, this book may be placed in the category of an engineering report. Most of the book is devoted to formulae and simple new methods of making rigid or flexible patterns, molds and casts, either from plastics or for use in connection with plastics. Photographs and drawings emphasize much of the text and bibliographical references are included for those who may wish to undertake additional research. The data included should prove of equal value to the factory engineer and the home craftsman.

•

The New Labor Law. Published by the Bureau of National Affairs, 24th and N Streets, N.W., Washington, D.C. 8½ x 11 in. 300 pp. $4.50.

This special report provides in convenient form for management all the working materials required for an initial understanding of the new Federal labor policy as represented by the Labor-Management Relations Act of 1947 (Hartley-Taft Act). It includes an explanation of the law's meaning to employers, employees, unions and the public, as well as a section-by-section analysis of the law. The full text of the law, and the documents which make up its legislative history, are reproduced.

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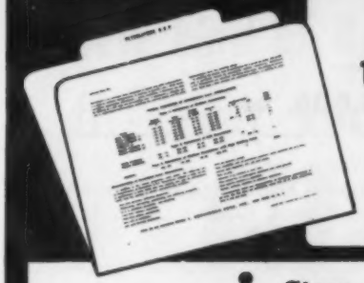
FOR FURTHER DETAILS, SEE AD ON PAGE 512



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BOOKLETS, CATALOGS, etc.

A Study of Accelerated Aging Tests. British Ministry of Supply, Shell Mex House, Strand, London, W.C. 2, England. 6¼ x 9½ in. 16 pp.

Issued as part of the British Services Rubber Investigations, representing research carried out by the Imperial Chemical Industries, Ltd., at the request of the British Admiralty, this report is devoted to a study of accelerated aging tests and contains recommendations for improving present testing technique. The summary and conclusions reached at the Birmingham Conference (a symposium held in Birmingham, England, on May 12, 1945, under the auspices of the Institution of the Rubber Industry) are given, as is the result of special investigations made at the I.C.I. laboratories in Blackley, Manchester. The recommendations for improving present technique cover general tests, atmospheric or ozone cracking tests, sunlight or accelerated light tests, and oven and bomb tests.

•

Columbia Caustic Soda. (Form A-100). Columbia Chemical Division, Pittsburgh Plate Glass Co., Fifth Ave. at Bellefield, Pittsburgh 13, Penna. 8½ x 11 in. 76 pp.

This booklet deals with all phases of caustic soda, from methods of manufacture to safety precautions to be employed in its handling. Designed for use by technical men, buyers, and executives as well as the student and layman, it is divided into several sections for ready reference. Included among the sections are the following: (1) Methods of manufacture; (2) Purification process—diaphragm cell electrolytic caustic soda; (3) Uses and consumption; (4) Forms and grades; (5) Economics of various forms; (6) Methods of handling and unloading. The properties of caustic soda are covered in a technical data section which is replete with numerous excellent charts and tables.

•

Fenwal Thermoswitch Controls. Fenwal, Inc., Ashland, Mass. 8¾ x 11¼ in. 58 pp.

Intended as a basic handbook of thermal procedure, this catalog covers the company's complete line of thermal responsive controls or switches. Liberally sprinkled throughout with numerous explanatory diagrams, photographs, and tables, it explains the basic Fenwal Thermoswitch principle and describes the method of selection and application of the proper Thermoswitch control together with the system for checking it under operating conditions. Specification tables, modifications, special features, and installation diagrams of various Thermoswitch controls are given.

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Fire and Explosion Hazards of the Manufacture of Synthetic Rubber. National Board of Fire Underwriters, 85 John St., New York 7, N. Y. 6 x 9 in. 36 pp.

Prepared by a special committee of the Advisory Engineering Council of the National Board of Fire Underwriters, this report covers butadiene, styrene and GR-S (Buna S). It details the various fire and explosion hazards involved in the manufacture of both the raw materials and the polymer, and outlines specific safeguards against such hazards. A table covering the properties of various materials used in the manufacture of synthetic rubber is included, as is a nomenclature of terms pertinent to the field.

•

Adhesive Facts. B. B. Chemical Co., 784 Memorial Drive, Cambridge, Mass. 8½ x 11 in. 4 pp.

This four-page bulletin contains considerable information for laboratory technicians, designers and production men on rubber-base and resin-base adhesives. It lists typical materials now being bonded with the company's Bostik cements, and portrays a number of the finished products. Types of adhesives in the company's line are discussed. A table summarizing a number of these adhesives, showing type, industries and products to which they apply, and the materials to be bonded, is included.

•

The Consolidated Mass Spectrometer. Consolidated Engineering Corp., 620 North Lake, Pasadena 4, Calif.. 8½ x 11 in. 4 pp.

The outstanding features of the company's new tool for quantitative and qualitative analysis are described in this bulletin. A concise explanation is given of how the spectrometer operates, together with its advantages in numerous installations, including biochemistry and metabolism studies, purity determination, studies on molecular structure, and the petroleum industry. A table on mixture analysis as well as a schematic drawing of the instrument is included.

•

DC Anti-Foam A. Dow Corning Corp., Midland, Mich. 8½ x 11 in. 4 pp.

This technical bulletin is the first in a series of compounding bulletins for the Dow Corning Silicone Notebook. It discusses the company's silicone compound for the prevention and suppression of foam in aqueous systems. The physical properties of the material are described and the various methods for its use are outlined. A number of industries in which the usefulness of DC Anti-Foam A has been established is also listed.

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FOR FURTHER DETAILS, SEE AD ON PAGE 512

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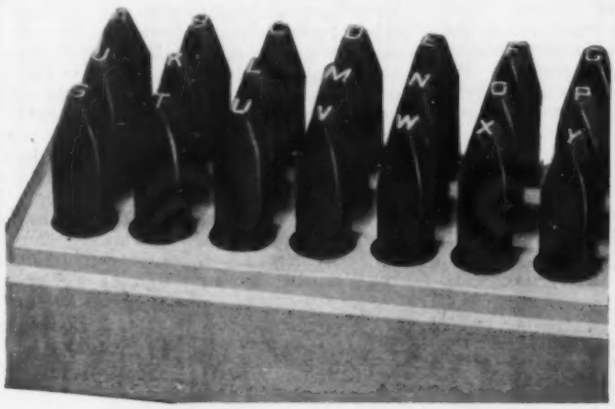

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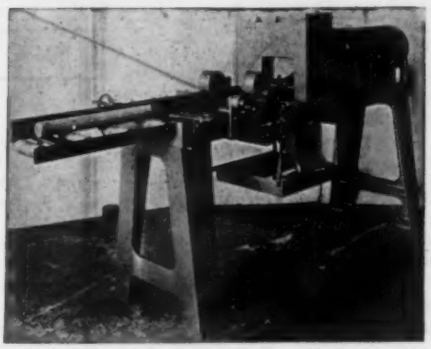

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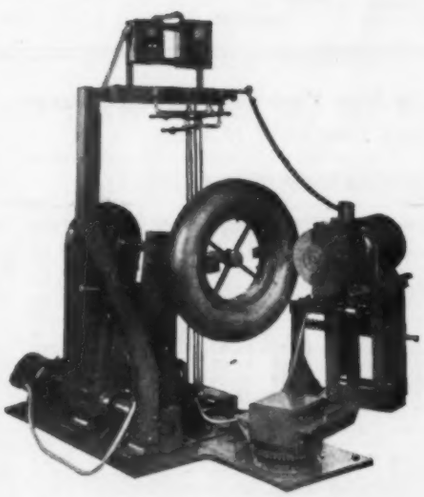

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MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK, AUG. 13, 1947

Natural Rubber

Prices for spot rubber on the Commodity Exchange have been most irregular for the past thirty days, ranging from 14.75 to 17.25. Futures have followed the same erratic course. News of the resumption of armed hostilities on Java on July 21 resulted in the spot price moving above a 17-cent figure, but the subsequent report of an armed truce at the request of the Security Council caused a rapid decline, reaching the low of 14.75 for the period yesterday (August 12).

Although a solution of political difficulties in the Netherlands East Indies seems fairly close, it seems equally evident that it will be many months before the situation in that quarter of the globe assumes the appearance of normal, especially insofar as natural rubber production and shipments are concerned. Prospective shipment of 350,000 tons from the Indies this year, or 45,000 tons a month, is not being met, and to date only some 70,000 tons have actually been shipped.

Shipments from Malaya, however, continue to hold up, a record tonnage of 95,961 tons being exported during the month of May, of which 51,084 went to the United States, 12,081 to the United Kingdom, and 32,796 to other countries. Ceylon shipments are also increasing, a total of 9,259 tons being exported in March as compared with 3,962 in January. Of the March shipments, 4,179 went to the United States.

Today's quotations in the outside market, London and Singapore, follow:

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.15¼
September	.15¼
October-December	.15⅛
Thick or Thin Latex Crepe:	
Spot	.31
October-December	.29½
Thin Brown Crepe, No. 2	.13¼
Ambers, No. 3	.13¼
Flat Bark Crepe	.11½

London Market

(Standard Smoked Sheets)

September	—— - 14.89
October-December	14.89 - 15.00
January-March	14.90 - 15.00

Singapore Market

(Standard Smoked Sheets)

August	13.33 - 13.43

Synthetic Rubber

(Dry Types)

Butaprene NXM	.470 - .495
Chemigum 30 N4NS	.400 - .470
Chemigum 50 N4NS	.400 - .470
Chemigum N3	.450 - .520
Hycar OR-25	.400 - .425
Hycar OR-15	.470 - .495
Hycar OS-10	.400 - .425
Neoprene Type E	—— - .650
Neoprene Types CG and AC	—— - .500
Neoprene Types FR and KNR	—— - .750
Neoprene Type S	—— - .320
Neoprene Type NC	—— - .250
Perbunan 18	.390 - .415
Perbunan 26	.400 - .425
Perbunan 35	.470 - .495
Thiokol Type A	.370 - .470
Thiokol Type FA	.520 - .620
Thiokol Type ST	.750 - .850
Thiokol PR-1	.750 - .850

Scrap Rubber

Little change in the discouraging scrap rubber market has been made since our last report. Although a few shipments were made to some rubber and reclaiming plants after the July vacation shut-downs, they were minor in the over-all picture. Scrap dealers see little room for improvement until world trade resumes on a larger scale and large-scale exports are again possible. Few prices are being offered. Those shown below are those which were in effect a few months ago:

(Prices to Consumers, Delivered Akron)

Mixed passenger tires	ton	$18.00
Beadless truck tires	ton	24.00
Mixed truck tires	ton	18.00
Beadless passenger tires	ton	24.00
No. 1 passenger peelings	ton	50.00
No. 1 truck peelings	ton	50.00
No. 2 passenger tubes	lb.	.07½
Red passenger tubes	lb.	.07½
Black passenger tubes	lb.	.06½
Mixed passenger tubes	lb.	.06¼
No. 2 truck tubes	lb.	.07¼
Red truck tubes	lb.	.07
Black truck tubes	lb.	.07
Buffings	ton	18.00

Cotton Tire Fabrics

Standard, Peeler, 12/4/2	lb.	.7400
Standard, Peeler, 14/4/2	lb.	.7600
Standard, Peeler, 16/4/3	lb.	.7850
Extra Staple, Peeler 12/4/2	lb.	.8375
Extra Staple, Peeler, 14/4/2	lb.	.8575
Extra Staple, Peeler, 16/4/3	lb.	.8825

Chafers

14.4 oz. (per sq. yard)	lb.	.7150
9.25 oz. (per sq. yard)	lb.	.7450
11.65 oz. (per sq. yard)	lb.	.6450
8.9 oz (per sq. yard)	lb.	.6900

Cotton

The price of middling uplands on the Cotton Exchange has swung in the extremely wide range of 561 points since our last report (July 14), high for the period being 40.18 on July 16 and low 34.57 on August 11. The average price of middling uplands for the month of July was 38.03, based on 22 trading days. After reaching the highest level since the end of the war on July 16, prices turned sharply downward for the remainder of the period. The initial impetus to the downward trend was due to the continuing decline in consumption of the staple, as indicated by the official June consumption figures. During the latter part of the period, the downward trend in prices was accelerated under the influence of the Government's estimate of an 11,844,000-bale cotton crop. The feeling in the market had been that the Government figure would be lower than 11,500,000 bales. Quotations for middling uplands on the Exchange follow:

	July 14	August 13		
	Close	High	Low	Close
October	33.90	32.78	32.45	32.75
December	33.11	32.45	32.08	32.39
March	32.65	32.33	31.98	32.30

Reclaimed Rubber

Tires

Black, Acid	lb.	.08¾ @	.09¼
Black, Digester	lb.	.08 @	.08½
Peels	lb.	.09 @	.09½
GR-S Whole Tire	lb.	.08½ @	.09

Inner Tubes

Black	lb.	.12¾ @	.13¼
Red	lb.	.13½ @	.14
GR-S	lb.	.09½ @	.10
Butyl	lb.	.08½ @	.09

Shoe

Unwashed	lb.	.08¼ @	.08¾

Closing Rubber Prices on New York Commodity Exchange

No. 1 Standard Contract of 10 Tons

FROM JULY 15 TO AUGUST 13

Date	Spot	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sales
July														
15	15.75	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.50	141
16	16.75	16.55	16.53	16.48	16.45	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	93
17	16.00	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	91
18	15.88	15.90	15.85	15.80	15.79	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	72
19	——	——	——	——	——	——	——	——	——	——	——	——	——	——
20	——	——	——	——	——	——	——	——	——	——	——	——	——	——
21	17.25	17.25	17.10	17.00	16.90	16.90	16.90	16.85	16.90	16.90	16.90	16.90	16.90	208
22	17.00	16.85	16.85	16.75	16.65	16.65	16.65	16.65	16.65	16.65	16.65	16.65	16.65	23
23	16.00	16.00	16.00	16.00	15.95	15.95	15.95	15.95	15.85	15.85	15.85	15.85	15.85	49
24	15.63	15.65	15.60	15.50	15.45	15.40	15.40	15.40	15.40	15.40	15.35	15.35	15.35	35
25	15.75	15.70	15.60	15.55	15.50	15.50	15.50	15.50	15.40	15.40	15.40	15.40	15.40	68
26	——	——	——	——	——	——	——	——	——	——	——	——	——	——
27	——	——	——	——	——	——	——	——	——	——	——	——	——	——
28	16.00	16.10	16.00	15.90	15.80	15.80	15.80	15.80	15.80	15.80	15.75	15.75	15.75	51
29	15.88	16.00	15.90	15.85	15.80	15.70	15.70	15.70	15.70	15.65	15.65	15.65	15.65	19
30	15.75	15.95	15.80	15.70	15.60	15.60	15.60	15.60	15.60	15.60	15.60	15.50	15.50	11
31	16.00	16.05	15.95	15.85	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	65
Aug.														
1	15.88	15.95	15.85	15.75	15.70	15.60	15.60	15.60	15.60	15.60	15.60	15.60	15.60	18
2	——	——	——	——	——	——	——	——	——	——	——	——	——	——
3	——	——	——	——	——	——	——	——	——	——	——	——	——	——
4	15.50	15.35	15.25	15.15	15.10	15.10	15.10	15.10	15.10	15.10	15.10	15.10	15.10	115
5	15.25	15.05	14.95	14.85	14.75	14.75	14.75	14.70	14.70	14.70	14.70	14.70	14.70	40
6	15.00	14.95	14.85	14.75	14.60	14.55	14.55	14.55	14.55	14.55	14.55	14.55	14.55	71
7	14.88	14.90	14.80	14.70	14.65	14.60	14.60	14.60	14.60	14.60	14.60	14.60	14.60	32
8	15.25	15.20	15.15	15.10	15.05	15.05	15.05	15.05	15.05	15.05	15.05	15.05	15.05	16
9	——	——	——	——	——	——	——	——	——	——	——	——	——	——
10	——	——	——	——	——	——	——	——	——	——	——	——	——	——
11	15.13	15.25	15.20	15.10	15.00	14.90	14.90	14.90	14.90	14.90	14.90	14.90	14.90	5
12	14.75	14.80	14.70	14.65	14.57	14.50	14.45	14.45	14.45	14.45	14.45	14.45	14.45	66
13	15.13	15.15	15.05	14.95	14.90	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	16

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Charles T. Wilson Co., Inc., United Bldg., Akron, Ohio
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Reinke & Amende, Inc., 1923 East Olympic Blvd., Los Angeles, Cal.
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FIRST NATIONAL TOWER
AKRON 8, OHIO
HEmlock 2188

CURRENT MARKET PRICES

Of Rubber Chemicals and Compounding Ingredients

AUGUST 13, 1947

Prices are, in general, f.o.b. works.
Range of prices indicates grade or quantity variations.
All trade or brand names are set off in quotation marks.
Abbreviations: bbls., barrels; c.l., carlot; l.c.l., less than carlot; dlvd., delivered; t.c., tank cars; min., minimum; dms., drums; cyl., cylinder.
* East of Mississippi.

—The arrangement of this section follows closely the Chemical Section of the 1945 RUBBER RED BOOK to which readers are referred to determine the classification of any material or brand name.
—Although suppliers of every material were contacted for price information, only those materials are listed for which quotations have been furnished us. The quotations are not guaranteed and prospective purchasers should contact suppliers for confirmation before placing orders. Suppliers are requested to send us regularly current prices on all of their materials used in the rubber industry.
—All requests for information or listings should be sent to Market Editor, RUBBER AGE, 250 West 57th St., New York 19, N. Y.

ACCELERATORS

"A-1"	lb.	.34	.39
"A-10"	lb.	.40	.47
"A-19"	lb.	.52	.58
"A-32"	lb.	.59	.69
"A-77"	lb.	.42	.55
"A-100"	lb.	.42	.55
"Accelerator No. 8" (dlvd.)	lb.	—	.75
"Accelerator No. 49"	lb.	.40	.42
"Accelerator No. 89" (dlvd.)	lb.	—	1.20
"Accelerator No. 122" (dlvd.)	lb.	—	1.30
"Accelerator No. 552" (dlvd.)	lb.	—	1.63
"Accelerator No. 808" (dlvd.)	lb.	.59	.61
"Accelerator No. 833" (dlvd.)	lb.	1.13	1.15
"Acrin" (dlvd.)	lb.	—	.65
"Advan"	lb.	.52	.55
"Altax"	lb.	.35	.38
"Arazate"	lb.	—	1.53
"Beutene"	lb.	.59	.61
"B-J-F"	lb.	.34	.36
"Butasan"	lb.	—	1.10
"Butazate"	lb.	—	1.10
"Butyl Eight"	lb.	1.00	1.05
"Captax"	lb.	.27	.30
"C-P-B"	lb.	—	1.95
"Cumate"	lb.	—	1.60
"Cuprax"	lb.	.60	.62
"Dibenzo G-M-F"	lb.	—	1.50
Diorthotolylguanidine (dlvd.)	lb.	.44	.50
Diphenylguanidine (dlvd.)	lb.	.39	.45
"El-Sixty"	lb.	.39	.46
"Ethasan"	lb.	—	1.10
"Ethazate"	lb.	—	1.10
"Ethyl Thiurad"	lb.	—	1.25
"Ethyl Tuex"	lb.	—	1.25
Formaniline (dlvd.)	lb.	.36	.37
"G-M-F"	lb.	—	1.95
"Good-rite Erie"	lb.	.60	.62
"Guantal"	lb.	.43	.50
"Hepteen"	lb.	.42	.44
"Base"	lb.	1.80	1.85
"Ledate"	lb.	—	1.20
Mercaptobenzothiazole	lb.	.27	.29
Mercaptobenzothiazyl Disulfide	lb.	.35	.37
"Methasan"	lb.	—	1.20
"Methazate"	lb.	—	1.20
"Monex"	lb.	—	1.25
"Mono Thiurad"	lb.	—	1.25
"Morfex 33"	lb.	.60	.62
"2-MT" (dlvd.)	lb.	.58	.60
"Novac"	lb.	—	1.40
"A-13"	lb.	.65	.67
"O-X-A-F"	lb.	.38	.40
"Pentex"	lb.	.74	.77
"Flour"	lb.	.12¼	.12¾
"Phenex" (tons)	lb.	—	.49
"Pipazate"	lb.	—	1.53
"Pip-Pip"	lb.	—	1.63
"R-2 Crystals"	lb.	—	1.55
"Rotax"	lb.	.39	.42
"SA 52"	lb.	—	1.25
"SA 57"	lb.	—	1.20
"SA 62"	lb.	—	1.25
"SA 66"	lb.	—	1.60
"SA 67"	lb.	—	1.10
"SA 77"	lb.	—	1.10
"Safex"	lb.	—	1.15
"Santocure"	lb.	.53	.60
Selazate"	lb.	—	1.60
"Selenac" (Ethyl, Methyl)	lb.	—	1.60
"Setsit-5"	lb.	.75	1.00
"SPDX-G" (tons)	lb.	—	.59
"Tellurac"	lb.	—	1.60
"Tepidone" (dlvd.)	lb.	—	.63
"Tetrone" (dlvd.)	lb.	—	1.25
"A" (dlvd.)	lb.	—	1.85
Thiocarbanilide (dlvd.)	lb.	—	.34
"Thiofide"	lb.	.35	.42
"Thionex" (dlvd.)	lb.	—	1.25
"Thiotax"	lb.	.27	.34
"Thiuram E" (and "M") (dlvd.)	lb.	—	1.25
"Trimene"	lb.	.54	.56
"Base"	lb.	1.03	1.06
Triphenylguanidine (dlvd.)	lb.	—	.50
"Tuads" (Ethyl, Methyl)	lb.	—	1.25
"Tuex"	lb.	—	1.25
"Ultra" (tons)	lb.	—	.99
"L"	lb.	—	1.04
"Ureka"	lb.	.55	.62
"Blend B"	lb.	.55	.62
"C"	lb.	.52	.59
"Vistanex" (dms.)	lb.	—	.42
"Vulcanex" (dlvd.)	lb.	—	.45
"Z-B-X"	lb.	—	2.45

ACCELERATORS (Cont'd)

"Zenite" (dlvd.)	lb.	.37	.39
"A" (dlvd.)	lb.	.42	.44
"B" (dlvd.)	lb.	.39	.41
"Zimate" ("Butyl," "Ethyl")	lb.	—	1.10
"Zimate, Methyl"	lb.	—	1.20

ACTIVATORS

Blue Lead, Sublimed (dlvd.)	lb.	.08½	.09
Fish Oil, Hydrogenated, Fatty Acid			
"Hydrofol Acid" (dlvd.)	lb.	.18¾	.22¼
"Hyfac 52" (dlvd.)	lb.	.20	.21½
"Neo-Fat H.F.O." (dlvd.)	lb.	.14⅞	.16⅞
"Stearex Beads" (dlvd.)	lb.	.14⅞	.15⅞
Lime, Hydrated			
"Arrowhead"	ton	16.00	19.50
"Sierra"	ton	16.00	19.50
Litharge			
"Eagle" (dlvd.)	lb.	.09¾	.10¾
"FBS" (dlvd.)	lb.	.17	.17½
Magnesium Oxide, Heavy			
"General Magnesite"	lb.	.06	.08
"Michigan No. 15"	lb.	.05	.05½
"Permanente"	lb.	.05	.06½
Magnesium Oxide, Light			
"Baker's" (Neoprene Grade)	lb.	—	.28
"General Magnesite" (Neoprene Grade)	lb.	—	.28
"General Magnesite" No. 101	lb.	—	.175
"General Magnesite" Standard	lb.	—	.22
"K & M"	lb.	—	.28
"Michigan No. 30"	lb.	—	.22½
"No. 40"	lb.	.25	.28
"Witco Extra Light"	lb.	.25	.27
Oleic Acid (dlvd.)	lb.	.31½	.34½
"Elaine O-18" (dlvd.)	lb.	.16½	.19¼
"L.C.P. Red Oil"	lb.	.31½	.33¾
"Red Oil" (20-24 Saponified) (dlvd.)	lb.	.17½	.19¾
Palm Oil Fatty Acid (c.l.)	lb.	—	.11
Potassium Oleate (drums)	lb.	—	.29½
Red Lead			
"Eagle" (dlvd.)	lb.	.10¾	.11¾
"No. 2 RM" (dlvd.)	lb.	.18½	.19
Sodium Laurate (drums)	lb.	—	.19
Sodium Oleate—Powder (drums)	lb.	—	.35
Paste (drums)	lb.	—	.20

ACTIVATORS (Cont'd)

Sodium Stearate—Powder (drums)	lb.	—	.35
USP Grade (drums)	lb.	—	.37
Stearic Acid, Single Pressed			
"S-24" (dlvd.)	lb.	.22½	.24
"Stearex B" (dlvd.)	lb.	.37	.38
Stearic Acid, Double Pressed			
"Alba" (dlvd.)	lb.	.26¼	.28½
"S-2-A" (dlvd.)	lb.	.24	.26½
"S-2-B" (dlvd.)	lb.	.23½	.26
Stearic Acid, Other			
"Hydrex" (c.l., dlvd.)	lb.	—	.14⅜
"Neo-Fat 1-60" (dlvd.)	lb.	—	.36½
"Neo-Fat 1-65" (dlvd.)	lb.	—	.38
"Stearite"	cwt.	36.00	38.00
White Lead Carbonate (dlvd.)	lb.	.16	.16¾
Zinc Laurate (c.l.)	lb.	—	.29
"Laurex"	lb.	.33	.34
Zinc Stearate	lb.	.29	.31
"Aquazinc"	lb.	.20	.35

Unclassified Activators

"Actifat" (dms.)	lb.	—	.18
"Acidex"	lb.	.19	.32
"Aero Ac 50"	lb.	.46	.52
"165"	lb.	.43	.45
"Barak" (dlvd.)	lb.	—	.60
"Bunac K-17"	lb.	.23	.25
"D-B-A"	lb.	—	1.95
"Delac J"	lb.	.55	.57
"P"	lb.	.45	.48
"Dibutylamine No. 117" (l.c.l., dms.)	lb.	—	.69
"Palmalene" (drums)	lb.	—	.15
"Polyac" (dlvd.)	lb.	—	1.40
"Ridacto" (drums)	lb.	.22	.24
"Snodotte" (dlvd.)	lb.	.24½	.25½
"SOAC" (min. 10 dms.)	cwt.	—	14.00
"Triamylamine No. 180" (l.c.l., drums)	lb.	—	1.01

ANTI-COAGULANTS

Anhydrous Ammonia (l.c.l.)	lb.	.02½	.02¾
"National" (cyl., dlvd.)	lb.	.16	.20
Aqua Ammonia (l.c.l., dms.)	lb.	—	.03
"M.B.M." (l.c.l.)	lb.	—	.35

ANTI-FOAMING AGENTS

"Aero Anti Foam H"	lb.	—	.12
"Regular"	lb.	—	.08½

ANTI-OXIDANTS

"Agerite Alba"	lb.	2.15	2.25
"Gel"	lb.	.55	.57
"Hipar"	lb.	.70	.72
"H. P."	lb.	.58	.60
"Powder"	lb.	.43	.45
"Resin"	lb.	.52	.54
"Resin D"	lb.	.43	.45
"Stalite"	lb.	.43	.45
"White"	lb.	1.30	1.40
"Akroflex C" (dlvd.)	lb.	.58	.60
"Aminox"	lb.	.43	.45
"Antox" (dlvd.)	lb.	.54	.56
"Aranox"	lb.	—	2.15
Benzoquinone	lb.	1.50	1.75
"Betanox Special"	lb.	.61	.63
"B-L-E"	lb.	.43	.45
"Powder"	lb.	.61	.63
"B-X-A"	lb.	.43	.45
Carvacrol	lb.	—	.80
Chlorcarvacrol	lb.	—	2.00
"Flectol H"	lb.	.43	.50
"Flexamine"	lb.	.58	.60
Gallic Acid, Tech.	lb.	1.10	1.15
USP or NF	lb.	1.27	1.30
Hydroquinone	lb.	.90	.94
Monomethylparaminophenol sulfate	lb.	2.40	2.90
"Neozone Standard" (dlvd.)	lb.	.66	.68
"A" (dlvd.)	lb.	.43	.45
"C" (dlvd.)	lb.	.47	.49
"D" (dlvd.)	lb.	.43	.45
"D Distilled" (dlvd.)	lb.	.48	.50
"Parazone" (dlvd.)	lb.	—	.68
"PDA-8"	lb.	.40	.42
"10"	lb.	.46	.48
"11"	lb.	.86	.95
"14"	lb.	.60	.62
"Perflectol"	lb.	.58	.65
"Permalux" (dlvd.)	lb.	1.53	1.55
Pyrogallic Acid, Resublimed	lb.	2.60	2.65
USP Crystals	lb.	2.10	2.15

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- Rack can be either stationary or mounted on casters.
- Trays have perforated metal surface and can be spaced to suit.
- Standard Rack has eighteen trays 36″ x 36″ spaced 2⅝″ apart.

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SPECIAL FEATURES

- Has micro-adjustment for accurate widths.
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- Has repulsion-induction motor which carries any overloads.
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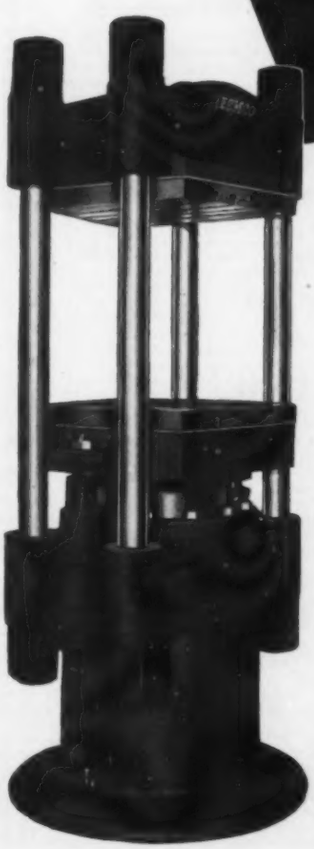
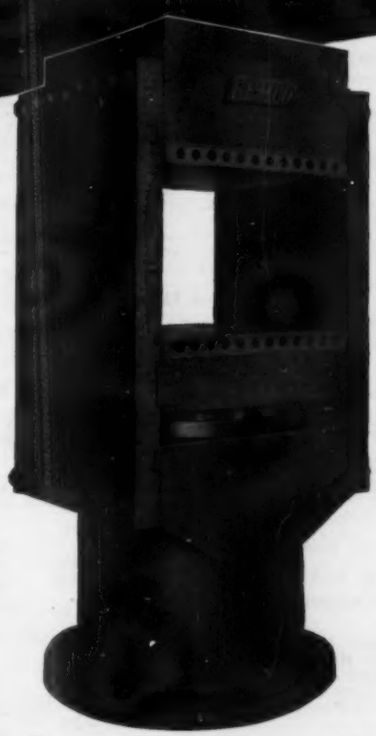
PRESSES

FOR RUBBER & PLASTICS PROCESSING





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ANTI-OXIDANTS (Cont'd)

Resorcin, Tech. (dlvd.)	lb.	——	.64
"Santoflex B"	lb.	.43	.50
"BX"	lb.	.57	.64
"Santovar-A"	lb.	1.30	1.37
"Santowhite"	lb.	1.40	1.52
"S.C.R." (tons)	lb.	——	.32
"Solux" (dlvd.)	lb.	1.48	1.50
"Stabilite" (tons)	lb.	——	.48
"Alba" (tons)	lb.	——	.69
"L" (tons)	lb.	——	.48
Tannic Acid, Tech.	lb.	.70	.79
"Thermoflex" (dlvd.)	lb.	1.48	1.50
"A" (dlvd.)	lb.	.70	.72
"C" (dlvd.)	lb.	.54	.56
Thymol	lb.	——	2.50
"V-G-B"	lb.	.43	.45

ANTI-SCORCHING AGENTS

"Good-rite Vultrol"	lb.	.50	.55
"Retarder W" (dlvd.)	lb.	——	.36
Salicylic Acid, Tech.	lb.	——	.33
"Sodium Acetate 60-62% Crystals"	lb.	——	.05½

ANTISEPTICS AND GERMICIDES

Formaldehyde (barrels)	lb.	——	.0695
"G-4"	lb.	.95	2.50
"G-11"	lb.	3.50	5.50
Methyl Para Hydroxy Benzoate	lb.	——	1.25
Ortho Cresol (26°-27°)	lb.	——	.18
"Soligen Drier"—Copper 8% (drums)	lb.	——	.21
"Zinc 8%" (dms.)	lb.	——	.19¾

AROMATICS (DEODORANTS)

"Arolene 1980" (c.l.)	lb.	——	.10
"2286"	lb.	——	.25
"2553" (c.l., dms.)	lb.	——	.13
"Bouquet 149"	lb.	——	3.00
Coumarin	lb.	2.75	2.90
"Curodex 19"	lb.	——	4.75
"188"	lb.	——	5.75
"198"	lb.	——	6.75
"D-6 Masking Perfume"	lb.	——	1.35
"Deodorant 63"	lb.	——	1.00
"Deodorant L-37"	lb.	2.00	2.40
"L-44"	lb.	2.50	2.90
"N.L.T.X."	lb.	1.85	2.15
"Latex Perfume 5"	lb.	——	3.25
"6"	lb.	——	7.50
"9"	lb.	——	.65
"Neutroleum Delta"	lb.	——	2.40
"Gamma"	lb.	——	3.40
"Parador A"	lb.	2.00	2.50
"B"	lb.	.65	1.00
"C"	lb.	2.75	3.25
"D"	lb.	1.50	2.00
"E"	lb.	.25	.55
"Perfume Oil Bouquet Vanilla M"	lb.	2.40	2.75
"Rodo No. 0"	lb.	4.00	4.50
"No. 10"	lb.	5.00	5.50
"Rubbarome" (dms.)	lb.	1.10	2.10
"Rubber Perfume 7"	lb.	——	9.15
"12"	lb.	——	1.90
"Russian Leather 7"	lb.	——	4.10
Vanillin	lb.	2.35	2.40

BLOWING AGENTS

Ammonium Bicarbonate (dlvd.)	lb.	.06¾	.09¾
"Blowing Agent No. 15"	lb.	——	.35
Sodium Bicarbonate, Tech. (c.l., bags)	cwt.	——	1.85
"Sponge Paste"	lb.	——	.20
"Unicel" (dlvd.)	lb.	——	.60
"ND" (dlvd.)	lb.	——	1.00
Urea	ton	73.00	90.00

BONDING AGENTS

"Durez 12987"	lb.	.48	.53
"Interlake Resin No. 4162"	lb.	——	1.50
"MDI"	lb.	7.25	7.75
"50"	lb.	3.60	3.85
"Reanite"	gal.	6.75	7.25
"Rex Compound 482"	gal.	——	1.05
"Ty-Ply Q" (and "S")	gal.	6.75	8.00

COAGULANTS

Acetic Acid—56% (bbls.)	cwt.	——	6.75
Glacial—99½% (bbls.)	cwt.	——	11.30
Calcium Nitrate, Tech, Crystals	lb.	.12½	.15
Hydroxyacetic Acid—70% (dms.)	lb.	.059	.084
Zinc Nitrate, Tech.	lb.	——	.21½

COLORING AGENTS

Black

Carbon Black—See *Reinforcing Agents*			
"Lampblack No. 10"	lb.	.06	.09
"Manico Black Iron Oxide" (50 lb. bags)	lb.	.0925	.095
"Raven Black Pure Iron Oxide"	cwt.	9.25	9.50

Blue

"Blue GD, Dispersed" (dlvd.)	lb.	——	3.95
"Paste" (dlvd.)	lb.	——	1.64
"Blue N" (dlvd.)	lb.	——	.945
"Blue YD, Dispersed" (dlvd.)	lb.	——	2.50
"Milori Blue 11840" (dlvd.)	lb.	——	.42
"Monastral Fast Blue CP" (dlvd.)	lb.	——	3.85
"PCD, Dispersed" (dlvd.)	lb.	——	2.50

Blue (Cont'd)

"Ramapo Blue"	lb.	3.40	3.45
"Rubber Blue X-1999"	lb.	——	1.00
"Stan-Tone Blue"	lb.	1.40	4.40
Ultramarine	lb.	.12	.30
"Victoria Blue BP-262-D"	lb.	2.25	2.30

Brown

Brown Iron Oxide	lb.	——	.10
"Mapico Brown" (50 lb. bags)	lb.	——	.12

Green

Green Chromium Oxide, Pure	cwt.	29.50	36.50
Green Chromium Oxide, Pure, Hydrated	cwt.	70.00	85.00
"Green FD, Dispersed" (dlvd.)	lb.	——	1.50
"Monastral Fast Green GSD, Dispersed" (dlvd.)	lb.	——	3.20
"GSD Paste" (dlvd.)	lb.	——	1.10
"Permansa Green CP-594"	lb.	——	1.35
"Pigment Green B"	lb.	——	1.50
"GL-652D"	lb.	.88	.93
"Ramapo Green"	lb.	4.00	4.05
"Rubber Green X-1292"	lb.	——	1.00
"Stan-Tone Green"	lb.	1.60	3.60
"Utility Green"	lb.	——	.30

Orange

"Molybdate Orange"	lb.	——	.39
"Orange F" (dlvd.)	lb.	——	3.35
"FD, Dispersed" (dlvd.)	lb.	——	2.50
"Rubber Orange X-2065"	lb.	——	2.60
"Stan-Tone Orange"	lb.	——	2.20

Purple

Purple Oxide	lb.	——	.08

Red

Barium Lithol Red	lb.	.60	.70
Cadmium Red	lb.	.95	1.25
"Cadmolith Red" (bbls.)	lb.	1.10	1.35
Calcium Lithol Red	lb.	.60	.70
"Graphic Red" (dlvd.)	lb.	——	.70
Indian Red, Pure	cwt.	9.10	10.25
"Jozite"	lb.	.08¼	.08¾
"Mapico Red 297" (50 lb. bags)	lb.	.10	.10¼
"Oximony" Iron Oxide	lb.	——	.09
Red Iron Oxide, Light	cwt.	9.60	10.75
"Red PB" (dlvd.)	lb.	——	1.80
"PBD, Dispersed" (dlvd.)	lb.	——	1.65
"2B" (dlvd.)	lb.	——	1.65
"2BD, Dispersed" (dlvd.)	lb.	——	1.50
"Rubanox Red" CP-762 (dlvd.)	lb.	——	1.30
"Rubber Red CP-339" (dlvd.)	lb.	——	1.05
"Rubber Red X-1148"	lb.	——	.70
"Solfast Red CP-663" (dlvd.)	lb.	——	1.80
"CP-787" (dlvd.)	lb.	——	1.30
"Stan-Tone Red"	lb.	1.10	2.20
"Watchung Red"	lb.	——	1.80

White—Lithopone

"Albalith"	lb.	.05½	.05¾
"Astrolith"	lb.	.055	.0578
"Cryptone No. 19"	lb.	.07	.07¼
"CB No. 21"	lb.	.07	.07¼
"Permalith"	lb.	.04¼	.04½
"Ponolith"	lb.	.05½	.05⅞
"Sunolith"	lb.	.055	.0578

White—Titanium Pigments

"Ravox"	lb.	.15½	.18½
"Ti-Cal"	lb.	.06¼	.06¾
"Ti-Pure"	lb.	.16½	.19½
"Titanox A"—all grades (dlvd.)	lb.	.14½	.15¼
"B-30" (dlvd.)	lb.	.05¾	.06
"C" (dlvd.)	lb.	.05½	.05¾
"RA"—all grades (dlvd.)	lb.	.15½	.16¼
"RC-HT" (dlvd.)	lb.	.05¼	.05¾
"Zopaque"	lb.	.16½	.17¼

White—Zinc Oxide (American Process)

"AZO-ZZZ 11" (and "22, 33, 44, 55")	lb.	.09½	.09¾
"Eagle"	lb.	.09	.09¾
"Horse Head Special"	lb.	.09½	.09¾
"XX Red"	lb.	.09½	.09¾
"St. Joe Black Label"	lb.	.09½	.09¾
"Green Label"	lb.	.09½	.09¾
"Red Label"	lb.	.09½	.09¾

White—Zinc Oxide (Dispersed)

Dispersed Zinc Oxide	lb.	——	.12

White—Zinc Oxide (French Process)

"AZO-ZZZ 66"	lb.	.11¾	.12½
"Florence Green Seal"	lb.	.11¼	.11½
"Red Seal"	lb.	.10¾	.11
"White Seal"	lb.	.11¾	.12
"Kadox 72"	lb.	.09½	.09¾
"Black Label"	lb.	.09½	.09¾
"Red Label"	lb.	.09½	.09¾
"U. S. P. 12"	lb.	.12¾	.13

White—Zinc Sulfide

"Cryptone ZS-800"	lb.	.10	.10¾

Yellow

"Anchor Brand Pure Iron Oxide"	cwt.	7.75	8.00
"Cadmolith Yellow" (bbls.)	lb.	——	.85
Chrome Yellow	lb.	——	.26
"Chrome Yellow 12310"	lb.	——	.18
"Ferrox"	cwt.	7.50	8.50

Yellow (Cont'd)

"Mapico Yellow" (50 lb. bags)	lb.	.07¾	.08
"Rubber Yellow X-1940"	lb.	——	1.60
"Stan-Tone Yellow"	lb.	1.20	1.75
Toluidine Yellow	lb.	——	1.60
"YL-556-D"	lb.	.75	.80
"Oximony" Iron Oxide	lb.	——	.06¾
"Yellow G" (dlvd.)	lb.	——	1.95
"GD, Dispersed" (dlvd.)	lb.	——	1.65
"HN" (dlvd.)	lb.	——	1.48
Zinc Yellow	lb.	——	.19

DISPERSING AGENTS

"Agchem SA-19"	lb.	——	.30
"SA-20"	lb.	——	.70
"Aquasol-AR 90%"	lb.	——	.14½
"Beaconol 52"	lb.	.60	.75
"Darvan No. 1" (and No. 2")	lb.	.19	.30
"Dilex"	lb.	——	.32
"Dispersaid"	lb.	1.25	1.35
"Halloid"	lb.	.03¾	.09½
"HornKem No. 1"	gal.	——	1.60
"No. 3G"	gal.	——	1.75
"No. 12"	lb.	——	.17
"Marasperse CB"	lb.	.10½	.18
"N"	lb.	.09	.10
"Ramol PW"	lb.	.18	.19
"Rubbex"	lb.	——	.25½
"Stan-Chem BQC"	lb.	.12¼	.17¼
"1067"	lb.	——	.13½
"1471"	lb.	.1687	.2187
"2251"	lb.	.12¼	.17¼
Triethanolamine (drums) dlvd.)	lb.	.19	.20
"Triton R-100"	lb.	.15½	.25
"Yelkin TT"	lb.	.36¾	.45¾
"Zinsper"	lb.	——	.15

EXTENDERS

"Advagum 1098"	lb.	——	.85
"Bunaweld Polymer No. 780"	lb.	——	.22
"No. 5514"	lb.	——	.30
"D-92" (and "D-93") (dms.)	lb.	——	.12
"Extender 600"	lb.	——	.208
"Multi-Plast MV 60 Emul."	gal.	.32	.37
"Naftolen MV 60 Emul."	gal.	.60	.65
"HV 60 Emul"	gal.	——	.80
"PR-162 Latex" (dms.)	gal.	1.00	1.60
"Synprolac"	lb.	——	.19
"Synprowax"	lb.	.16	.19
"Vistanex Polybutene"	lb.	——	.32

FILLERS (Inert and Reinforcing)

Abrasives

"Carbonite"	lb.	.15	.95
"Lionite"	lb.	.09¾	.90
Aluminum Hydrate	lb.	——	.17
Aluminum Silicate "Silical"	ton	37.00	55.00
"Marter White"	ton	20.50	30.00
Barium Carbonate (l.c.l.)	ton	77.00	85.00
Barytes No. 1 Floated, White	ton	30.10	41.55
No. 2 Floated, Unbleached	ton	28.10	38.95
"No. 22 Barytes" (c.l.)	ton	——	18.37
"Foam A"	ton	——	30.10
Bentonite (c.l.)	ton	——	11.00
"SPV Volclay" (c.l.)	ton	——	11.00
Blanc Fixe	ton	72.50	120.00
Blanc Fixe	ton	60.00	120.00
Calcium Carbonate "Atomite" (c.l.)	ton	——	30.00
"B.I. White No. 1" (c.l.)	ton	——	7.50
"Blue-Star XX"	ton	——	45.00
"B.I. White No. 1" (c.l.)	ton	——	7.00
"Calcene T"	ton	40.00	50.00
"Camelwhite"	ton	27.50	30.00
"Kalite" (c.l.)	ton	——	33.00
"Kalvan" (c.l.)	ton	——	105.00
"Lesamite" (c.l.)	ton	——	27.50
"Lim-Cal" (c.l.)	ton	——	12.50
"Millical" (c.l.)	ton	——	22.00
"Sierracal"	ton	15.00	18.50
"Suspenso" (c.l.)	ton	——	20.00
"Swansdown" (c.l.)	ton	——	18.00
"Witcarb R" (c.l.)	ton	——	105.00
"R-12" (c.l.)	ton	40.00	60.00
Calcium Silicate "Silene EF"	ton	110.00	120.00
Calcium Sulfate, Anhydrous "Snow White Filler"	ton	——	17.00
Calcium Sulfate, Hydrous "Crysta-Cal" (c.l.)	ton	——	12.50
"Terra Alba No. 1"	ton	12.00	14.40
Chalk Whiting (l.c.l.)	lb.	.0150	.0175
"Recco Paris Whiting"	ton	——	25.00
Clay "Alsite" (c.l.)	ton	——	13.00
"Aluminum Flake"	ton	15.50	60.00
"A.S.P. No. 1" (c.l.)	ton	——	30.00
"No. 11" (c.l.)	ton	——	40.00
"Buca" (c.l.)	ton	——	44.00
"Catalpo" (c.l.)	ton	——	33.00
"Champion"	ton	——	13.00
"C.S.D." (c.l.)	ton	——	12.00
"Crown"	ton	——	13.00
"Dixie" (c.l.)	ton	——	13.00
"Hydratex R"	ton	28.00	40.00
"Kaolloid Clay" (c.l.)	ton	——	10.50
"Markham" (c.l.)	ton	——	13.00
"McNamee" (c.l.)	ton	——	12.50
"Oldham"	ton	——	13.00
"Paragon"	ton	12.50	27.20
"Recco" (c.l.)	ton	——	13.00

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FILLERS (Cont'd)

"Stellar-R"	ton	—	50.00
"Suprex"	ton	13.00	27.70
"Upton"	ton	19.50	21.00
"Whitetex" (c.l.)	ton	—	50.00
"Witco No. 1" (c.l.)	ton	13.00	33.00
"No. 2" (c.l.)	ton	13.00	33.00
Diatomaceous Earth	ton	30.00	50.00
"Kaylorite" (c.l.)	ton	—	30.00
Dolomite (c.l.)	ton	11.00	12.00
Flock			
Cotton	lb.	.08½	.20
"Filfloc F 40-9000"	lb.	—	.16
"Filfloc F 6000"	lb.	—	.22
Rayon, bleached or dyed	lb.	.85	1.50
Rayon, grey	lb.	—	.18
"Solka-Floc" (l.c.l.)	lb.	.05	.12
Wool, bleached or dyed	lb.	.70	1.00
Glue, Bone (dlvd.)	lb.	.16½	.18½
Ground Glass (l.c.l.)	lb.	.04	.06
Leather, Shredded	lb.	.05	.17
Lignin	lb.	.03	.06
"Indulin"	lb.	—	.09
Limestone, Pulverized	ton	3.25	10.00
"Micro Velva"	ton	30.00	32.00
"Velvet Filler, Regular"	ton	16.00	18.00
Magnesium Carbonate	lb.	.07¼	.08¼
"Clearcarb"	lb.	.10	.10½
"K & M"	lb.	.07¼	.08¼
Magnesium Silicate	ton	18.00	35.00
"Airex"	ton	22.50	23.50
"Asbestol"	ton	17.00	25.00
"Blue Star Talc"	ton	—	21.00
"L.S. Silver"	ton	24.50	26.50
"Sierra White"	ton	20.75	22.75
Mica	lb.	.03	.07
"Concord"	lb.	.06¼	.06¾
"Micro-Mica"	lb.	.06½	.07
"Mineralite" (c.l.)	ton	30.00	40.00
"Silversheen"	lb.	.06¼	.06¾
"Triple A Mica" (c.l.)	ton	—	25.00
"Wet Ground Mica No. 160"	lb.	.05¼	.06¾
Mineral Black			
"Keystone 126"	ton	—	13.00
Pumice	lb.	.03	.05
Pyrophyllite			
"Pyrax A" (c.l.)	ton	—	11.50
"WA" (c.l.)	ton	—	13.00
Silica	ton	16.00	27.00
"Blue Star"	ton	—	21.50
Slate, Powdered (l.c.l.)	ton	15.00	20.00
Talc, Domestic	ton	9.00	20.00
Walnut Shell Flour	ton	35.00	65.00
Whiting, Commercial	ton	8.00	20.00
"Cameline" (c.l.)	ton	8.50	10.00
"C-C-O White"	ton	—	14.50
"Keystone" (c.l.)	ton	—	16.00
"Snowflake" (c.l.)	ton	—	18.00
"Veroc" (c.l.)	ton	—	8.50
"York White" (c.l.)	ton	—	9.00
Wood Flour	ton	20.00	62.18

FINISHING MATERIALS, SURFACE

"Beaco Finishes"	gal.	1.05	1.35
"Black Out"	gal.	4.50	8.00
Shellac, Orange Gum	lb.	.70	.80
"VanWax"	gal.	1.25	1.30

FLAME RETARDANTS

Chlorinated Paraffin	lb.	.10	.25
"Halowax"	lb.	.24	.30
"Zinc Borate 3167"	lb.	.12	.16¾
"Zyrox"	lb.	.35	.45

LUBRICANTS, MOLD

"Aquadag"	lb.	3.15	3.45
"Aquarex L Paste" (dlvd.)	lb.	—	.85
"MDL Paste" (dlvd.)	lb.	—	.32
Borax, Granular (l.c.l.)	ton	70.00	80.00
"Colite Concentrate" (dms.)	gal.	—	.90
"Concentrex"	lb.	—	.20
"Dipex"	lb.	.14	.18
"Dri-Lube"	lb.	—	.18
"Erlen Mold Lubricant"	gal.	1.00	1.25
"Glycerized Lubricant"	gal.	—	1.50
"Glydag"	lb.	1.30	2.00
"G.T.M.C. Solution"	lb.	1.05	1.35
"Kokobace"	lb.	—	.12
"Latex-Lube" (dlvd.)	lb.	—	.23
"Liqui-Lube" (dlvd.)	lb.	—	.15½
"Lubrex"	lb.	.25	.30
"Migralube"	lb.	—	.30
"Moldex"	lb.	—	.12½
"Moldeze No. 1"	gal.	—	36.00
"No. 2"	gal.	—	10.00
"No. 3"	gal.	—	25.00
"Mold-Slick"	lb.	.202	.215
"Orvus WA Paste" (dms.)	lb.	—	.25
"Prodag"	lb.	.25	.38
"Redotex Flakes" (dlvd.)	lb.	.20⅞	.21½
"Powder" (dlvd.)	lb.	.21⅜	.22
"Rubber-Flo"	gal.	—	1.15
"Rubber-Glo"	gal.	—	.94
"Rusco Mold Paste"	lb.	.12	.18
"Sericite" (l.c.l.)	ton	65.00	75.00
"Uico Mold Soap"	lb.	.16	.29
"Werkrite Flakes" (dlvd.)	lb.	.16⅜	.17
"Powder" (dlvd.)	lb.	.17⅛	.17¾

LUBRICANTS, RUBBER

Lithium Stearate	lb.	.75	.77
Propylene Stearate (drums)	lb.	—	.40
"Rubberol"	lb.	—	.18½

LUBRICANTS, RUBBER SURFACE

Barium Stearate	lb.	.55	.56
Calcium Stearate	lb.	.51	.53
"Orel"	gal.	1.85	2.00
Polyethylene Glycol	lb.	.25	.26

LUBRICANTS, RUBBER SURFACE (Cont'd)

"Rexanol A"	lb.	—	.11
"Separex A"	lb.	—	.15
Zinc Stearate	lb.	.54	.55

MOLD CLEANERS

"Actusol" (dlvd.)	gal.	—	1.45
"Metso 99"	cwt.	3.05	4.45
"Granular"	cwt.	2.50	3.55
"Rubber-Sol"	gal.	—	1.89
"Shelblast"	ton	80.00	-140.00
Sodium Silicate	cwt.	.80	1.40
"Sprex A.C." (dlvd.)	lb.	—	.15½

PEPTIZING AGENTS

Carbothermic Magnesia	lb.	—	.13½
"Peptizer P-12"	lb.	.84	.90

PLASTICIZERS & SOFTENERS

"AA" (drums)	lb.	—	.15¾
"Acto 500"	lb.	—	.09
"Adipol BCA" (dms.)	lb.	.43½	.44
"Amalgamator Z-4"	lb.	—	.30
"American" Pine Tar	gal.	.30½	.38½
"Bardex"	lb.	.05	.05¼
"Bardol"	lb.	.02¼	.03
"B"	lb.	.05	.05¼
"Bayol D"	gal.	.29½	.31½
"F"	gal.	.46	.49
Beeswax, Refined & Bleached	lb.	.64	.74
Yellow Refined	lb.	.63½	.68
"Bondogen"	lb.	.55	.60
"B.R.C. No. 20"	lb.	.0105	.0115
"B.R.H. 2"	lb.	.0225	.0235
"BRS 700"	lb.	.012	.018
"B.R.T. 3"	lb.	.019	.02
"4"	lb.	.02	.021
"7"	lb.	.0215	.0225
"B.R.V."	lb.	.03	.0375
"Bunarex"	lb.	.05½	.06½
"Bunatak M"	lb.	—	.20
"O"	lb.	—	.18
"R"	lb.	—	.14
"U"	lb.	—	.15
"No. 21"	lb.	—	.08
"No. 90"	lb.	—	.08
"No. 865"	lb.	—	.17
"No. 1080"	lb.	—	.09½
Burgundy Pitch	lb.	.1051	.1115
"Butac"	lb.	.1275	.1650
Butyl Benzyl Sebacate	lb.	.75	.77½
Butyl Palmitate	lb.	—	.26⅜
Butyl Roleate	lb.	.16	.18
"BWH-1"	lb.	—	.11
"Campol" (t.c.)	ton	—	42.00
Candelilla Wax, Prime	lb.	.78	.85
"Carbonex"	lb.	.03	.03½
"S" Flakes	lb.	.04½	.05
"S" Plastic	lb.	.0435	.046
"Carbowax 4000" (drums)	lb.	.29	.30
"Cardolite 615"	lb.	.37	.40
"816"	lb.	.25½	.28½
"5858"	lb.	.42	.46
Carnauba Wax, Crude	lb.	1.30	1.35
Refined	lb.	1.40	1.45
Substitute	lb.	.45	1.08
Yellow	lb.	1.75	1.80
"Celluflex 142" (and "179") (drums)	lb.	—	.31½
Ceresine Wax	lb.	.15	.20
"Contogum"	lb.	.06¾	.10¼
"Cumar Resins"	lb.	.05½	.14½
"Darex Copolymer X11"	lb.	.40	.50
"X54"	lb.	.42	.60
"D.B.M."	lb.	—	.30
Degras, Common	lb.	.10	.14
Diamylphenol (l.c.l., drums)	lb.	—	.21
Dibenzyl Ether (drums)	lb.	—	.40
Dibenzyl Sebacate	lb.	.66	.70½
Dibutyl Phthalate	lb.	.32	.39
Dibutyl Sebacate—Tech.	lb.	.49	.51½
C.P.	lb.	.51	.53½
Dicapryl Phthalate	lb.	.24½	.27
"Di-Carbitol Phthalate" (dms.)	lb.	.37½	.38
Dicyclohexyl Phthalate	lb.	—	.43
"Dielex"	lb.	.05½	.06
Diethyl Phthalate (t.c.)	lb.	.31½	.38½
Dihexyl Sebacate	lb.	.47	.49½
"Monoplex 5"	lb.	.98	1.00
Dimethyl Phthalate	lb.	.23½	.30½
Dimethyl Sebacate	lb.	.65	.67½
"Dinopol" (dms.)	lb.	.43½	.44
Dioctyl Phthalate (dms.)	lb.	.39½	.40
"Dipolymer Oil"	gal.	.33	.38
"Dispersing Oil No. 10"	lb.	.04½	.04¾
"Dutrex A" ("B," "5," "6")	lb.	.02½	.03¾
"15"	gal.	.10	.189
"20," "21," "25"	lb.	—	.03
"Dyal 89"	lb.	—	.45
"Econo-Plast" (drums)	lb.	.03¼	.03¾
"ELA" (dlvd.)	lb.	—	.80
"Estac"	lb.	—	.14½
"Ethox" (dms.)	lb.	.35½	.36
"Flexol DOP"	lb.	.379	.424
"TOF"	lb.	.45	.52
"3GH"	lb.	.55	.60
"3GO"	lb.	.515	.60
"4GO"	lb.	.40	.47
"H-70"	lb.	.56¾	.64½
"Hercolyn" (dlvd.)	lb.	.12	.16
"Herron-H.T."	gal.	.17	.23
"Herron-Plas"	lb.	—	.03½
"Herron-Wax"	lb.	—	.04½
"HT-300"	lb.	.45¼	.53

PLASTICIZERS & SOFTENERS (Cont'd)

"Indonex 633½" ("634½, 638½, 639½")	gal.	.14	.16
"VG" (dlvd.)	lb.	—	.07
"Indopol H-300" (bbls.)	gal.	1.28	1.32
"JMH"	lb.	—	.65
"Kapsol" (dms.)	lb.	.50½	.51
"KP 23" (dms.)	lb.	.48½	.49
"70" (dms.)	lb.	.39½	.40
"120" (dms.)	lb.	.59½	.60
"140" (dms.)	lb.	.49½	.50
"150" (dms.)	lb.	.41½	.42
"201" (dms.)	lb.	.40	.42
"Kronisol" (drums)	lb.	.35½	.36
"Kronitex" (drums)	lb.	.31½	.32
Lanolin, Tech., Anhydrous	lb.	.20	.26
Lead Oleate	lb.	.16½	.42
"Lindol" (drums)	lb.	—	.25½
2-Mercaptoethanol (drums)	lb.	—	.75
"Methox" (dms.)	lb.	.35½	.36
Methyl Oleate	lb.	—	.20
Methyl Stearate	lb.	—	.34
"Monoplex DOS"	lb.	.87½	.88½
"5" (dms.)	lb.	.98	1.00
"11" (dms.)	lb.	.50	.51
"16" (dms.)	lb.	.45	.46
"Montan Substitute No. 506"	lb.	.425	.435
Montan Wax, Crude	lb.	.50	.55
"Monten Wax" (c.l.)	lb.	.52	.55
"Monty Wax"	lb.	—	.35
"Multi-Plast" (drums)	lb.	.04½	.05
"Naftolen HV" (and "R-100") (drums)	lb.	.11	.12
"Natac"	lb.	.1275	.1650
"LV" and "MV" (drums)	lb.	.05¼	.05¾
"Neolene 210" (t.c.)	lb.	—	.16
"212" (t.c.)	lb.	—	.14
"220" (t.c.)	lb.	—	.15
"Nerium"	lb.	—	.09
"Nevillac Resins" (drums)	lb.	.23	.45
"Neville Resins" (drums)	lb.	.09	.14½
"Nevindene Resins" (drums)	lb.	.11½	.14½
"Nevinol" (drums)	lb.	—	.16
"Nevoll"	lb.	.03	.04
"Nevtex 10" (drums)	lb.	—	.08½
"Nuba 1" (and "2") (drums)	lb.	—	.03½
"3X" (drums)	lb.	—	.05
"15 (and 30) Oil" (drums)	lb.	—	.17¾
"781 Oil" (drums)	lb.	—	.22
"No. 480 Oil Proof Resin"	lb.	.14	.14½
"Opalwax"	lb.	—	.45
Ortho-Nitrobiphenyl	lb.	.06	.11
"Ozokerite Wax No. 64 White"	lb.	.31	.32
"Yellow"	lb.	.25	.26
"P-1" (and "4, 6, 8, 20")	lb.	.26½	.33
"P-75"	lb.	.66	.72
"Pale 4" (and "1000")	lb.	—	.17¼
Palm Oil	lb.	—	.11
"Paradene Resins" (drums)	lb.	.05½	.06½
"Para Flux" (drums)	gal.	—	.19
"2016" (l.c.l.)	gal.	—	.20
"Para Lube" (l.c.l.)	lb.	—	.048
"Paraplex G-25"	lb.	1.04½	1.05½
"G-40"	lb.	.48¾	.49¾
"Parmo"	lb.	.06	.13½
"Paroil 143"	lb.	—	.09¾
"170, Powdered"	lb.	—	.18
"Pentalene 90" (l.c.l., dms.)	lb.	—	.17
"92" (l.c.l., drums)	lb.	—	.25
"Pentaphen No. 114" (l.c.l., bags)	lb.	—	.23
"Pepton 22"	lb.	.70	.75
"PG-16" (drums)	lb.	—	.34
"Philplast No. 1"	gal.	.18	.35
"No. 2"	gal.	.13	.35
"Picco 10" (and "25")	lb.	—	.11
"75" (and "100")	lb.	—	.10½
"S.O.S."	gal.	.29	.34
"Piccocizer 30"	lb.	.05½	.06
"D"	lb.	—	.10
"Piccolastic A" (and "B, C, D, E")	lb.	.20	.20½
"F"	lb.	.12½	.13
"Piccolyte S Resins"	lb.	.17	.20½
"Piccoumaron Resins"	lb.	.07	.11
"Piccovar"	lb.	.11	.11½
"Piccovol"	lb.	.02	.02¾
"Pictar"	gal.	.18	.23
"Plas-Blend 360"	lb.	.02½	.03
"Plastac M"	lb.	—	.09½
"Plasticizer 3"	lb.	.12	.14
"Plasticizer No. 7-2"	lb.	—	.60
"No. 11-2"	lb.	—	.32
"Plasticizer No. 1889"	lb.	—	.565
"No. 1919"	lb.	—	.52
"No. 2069" (l.c.l.)	gal.	—	.23
"No. 2070" (l.c.l.)	gal.	—	.30
"Plasticizer ODN" (Tech.)	lb.	.30	.357
Purified	lb.	.36	.417
"Plasticizer SC"	lb.	—	.75
"Plasticizer VA-1"	lb.	.33	.35
"Plastoflex 50"	lb.	.36	.37
"J-21"	lb.	—	.41
"Plastogen"	lb.	.07¾	.08
"Plastolein X-55" (dms.)	lb.	—	.60
"X-148" (dms.)	lb.	—	.70
"Plastone"	lb.	.27	.30
"Polymel D"	lb.	—	.20
"Polymel Liquid"	gal.	.12	.17
"Polymel Resins"	lb.	.029	.05
"PT 400" ("600," "800") (c.l., dms.)	gal.	.30½	.39½
"Refrigerator Oil 145-R"	gal.	—	1.25
"Reogen"	lb.	.11½	.12
"465 Resin" (drums)	lb.	—	.04½

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"Resin 731"	lb.	——	.13¼
"Resin C"	lb.	.015 -	.021
"Resinex"	lb.	.02¾ -	.03¼
"L-4"	lb.	.01¾ -	.02½
"Ridbo 369" (drums)	lb.	.08 -	.09
"369-F" (drums)	lb.	—— -	.12
Rosin Oil	gal.	.54 -	1.20
"R.P.A. No. 2" (dlvd.)	lb.	—— -	.65
"No. 3"	lb.	—— -	.46
"No. 4" (dlvd.)	lb.	—— -	.80
"No. 5" (dlvd.)	lb.	—— -	.57
"R.S.O. Softening Oil"	lb.	.02½ -	.03
"Rubtar"	gal.	—— -	.40
"Santicizer B-16"	lb.	.50 -	.57
"E-15"	lb.	.47 -	.54
"M-17"	lb.	.44 -	.51
"No. 140"	lb.	.31 -	.38
"Softener No. 20"	gal.	.09 -	.25
"S.P.C."	lb.	—— -	.19½
"Stanolind Petrolatum"	lb.	.032 -	.069
"Wax"	lb.	.25 -	.30
"Staybelite Resin" (dms.)	lb.	—— -	.11
"Sunny South" Pine Tar	gal.	.30½ -	.38½
"Superla Wax"	lb.	.23 -	.28
"Syncera Wax"	lb.	.16 -	.21
"Synplasticizer"	lb.	—— -	.10
"Syn Tac" (c.l.)	gal.	—— -	.33
"Synthol"	lb.	—— -	.22½
Tar, Refined	gal.	.10 -	.15
"K-Tarnel NR" (t.c.)	lb.	—— -	.0851
"Terpene A"	gal.	—— -	.65
"TP-90B" (and "TP-95")	lb.	.65 -	.75
"TP-99	lb.	.60 -	.70
Triacetin	lb.	.34 -	.45
Tricresyl Prosphate	lb.	—— -	.33½
"Turgum S"	lb.	.11½ -	.13
"Vanadiset A" (to "F")	lb.	.0165 -	.05
"Pulverized"	lb.	.08½ -	.31
"Solution"	gal.	.40 -	.65
"Vistac No. 1"	gal.	—— -	1.32
"No. 2"	gal.	—— -	1.66
"No. 4"	gal.	—— -	1.80
"Wilcor-Plast"	lb.	.02⅛ -	.02⅜
"Witresin"—Granular	ton	41.00 -	43.00
Solid	ton	36.00 -	38.00

PROCESSING AIDS

Castor Oil, Processed (dms.)	lb.	—— -	.17¼
Refined (drums)	lb.	—— -	.15¼
"Castorwax" (min. 400 lbs.)	lb.	—— -	.25
"Dutrex 7"	lb.	.02½ -	.03¾
"30"	gal.	.24 -	.27
"ELA" (dlvd.)	lb.	—— -	.80
"Resin No. 510"	lb.	—— -	.16
"Wilmac D-X"	lb.	.15 -	.16½
"Zeton" (dms.)	lb.	—— -	.32

PROTECTIVE & STABILIZING AGENTS

"Agchem SA-9" (to "SA-12")	lb.	.65 -	1.02
"Alpha Protein"	lb.	.28 -	.32
"Aroostoocrat"	lb.	—— -	.07½
Acacia	lb.	.12¼ -	.21
Carob Bean Flour	lb.	.42 -	.50
Casein	lb.	.33 -	.40
Ethylene Diamine 68%	lb.	.57 -	.58
Karaya Gum	lb.	.36 -	.45
"Prosein"	lb.	.071 -	.09
"Rex Compound No. 2801"	lb.	—— -	.15
Sodium Alginate	lb.	—— -	1.50
"Stablex B"	lb.	—— -	.95
Tragacanth Flakes	lb.	.60 -	1.35

RECLAIMING AGENTS

"1-D Heavy Oil" (drums)	lb.	.04 -	.05
"No. 517 H.B. Oil"	gal.	.11½ -	.16½
"535"	gal.	.22 -	.27
"No. 523 H.S. Oil"	gal.	.22 -	.27
"C-6 Oil" (and "28," "32")	gal.	.33 -	.38
"C-10 Oil"	gal.	.21 -	.25
"C-33 Oil"	gal.	.19 -	.24
Caustic Soda—Flake 76% (c.l., drums)	cwt.	—— -	2.90
Liquid 50% (t.c.)	cwt.	—— -	2.00
Solid 76% (c.l., drums)	cwt.	2.50 -	2.75
Cresylic Acid (99-100%)	gal.	—— -	.95
"D-4"	gal.	.19 -	.24
"E-5"	gal.	.17 -	.22
Heavy Aromatic Naphtha (t.c.)	gal.	—— -	8.25
"LX-83 Reclaiming Solvent"	gal.	.13 -	.23
"LX-572 Reclaiming Oil"	gal.	.19 -	.28
"PT 101 Pine Tar Oil"	gal.	.30½ -	.39½
"PT 150 Solventine"	gal.	.60 -	.75
"Q Oil"	gal.	.206 -	.256
"Reclaiming Oil 1621"	lb.	.02 -	.02¾
"Reclaiming Reagent No. 3"	lb.	.12 -	.15
"Reclaiming Resin No. 1"	gal.	.15 -	.35
"R.P.A. No. 3" (dlvd.)	lb.	—— -	.46
Soda Ash (c.l., bags)	cwt.	—— -	1.20
"Solvent 534"	gal.	.22 -	.27
"Solvent Oil 21"	gal.	—— -	.24
"Wilcor Reclaiming Oil No. 111" (drums)	gal.	.28 -	.32
"No. 151" (drums)	gal.	.28 -	.32
"X-1 Resinous Oil"	lb.	.0135 -	.02
"X-63 Solvent"	gal.	.30 -	.28

REINFORCING AGENTS—CARBON BLACK

Channel, Hard Processing (HPC) (bags)

"Atlantic HPC-98"	lb.	.064 -	.102
"Continental F"	lb.	.0632 -	.1025
"Croflex"	lb.	.0632 -	.1025
"Crow"	lb.	.0632 -	.1025
"Dixiedensed" (and "S")	lb.	.0632 -	.1025
"Huber HX"	lb.	.0632 -	.1050
"Kosmobile" (and "S")	lb.	.0632 -	.1025
"Kosmos T"	lb.	.0632 -	.1025
"Micronex HPC"	lb.	.0632 -	.1025
"Spheron 4"	lb.	.0632 -	.102
"Witco Disperso No. 6"	lb.	.0632 -	.1025

Channel, Medium Processing (MPC) (bags)

"Atlantic MPC-95"	lb.	.064 -	.102
"Colloidal Micronex" (dms.)	lb.	.07¼ -	.08¼
"Continental A"	lb.	.0632 -	.1050
"Croflex TH"	lb.	.0632 -	.1025
"Dixie R-1"	lb.	.0632 -	.1025
"Dixiedensed HM" (and "S-66")	lb.	.0632 -	.1025
"Huber TX"	lb.	.0632 -	.1050
"Kosmobile HM" (and "S-66, SMG")	lb.	.0632 -	.1025
"Kosmos M"	lb.	.0632 -	.1025
"Micronex Standard"	lb.	.0632 -	.1025
"Spheron 6"	lb.	.0632 -	.102
"Witco Disperso No. 1"	lb.	.0632 -	.1025

Channel, Easy Processing (EPC) (bags)

"Atlantic EPC E-42"	lb.	.064 -	.102
"Collocarb"	lb.	—— -	.065
"Continental AA"	lb.	.0632 -	.1025
"Croflex 77"	lb.	.0632 -	.1025
"Dixiedensed 77"	lb.	.0632 -	.1025
"Kosmobile 77"	lb.	.0632 -	.1025
"Micronex W-6"	lb.	.0632 -	.1025
"Spheron 9"	lb.	.0632 -	.102
"Witco Disperser No. 12"	lb.	.0632 -	.1025
"Wyex"	lb.	.0632 -	.105

Channel, Conductive (CC) (bags)

"Dixie 5"	lb.	.0740 -	.1175
"Kosmink"	lb.	.0740 -	.1175
"Spheron C"	lb.	.08 -	.12½
"I"	lb.	.066 -	.111
"N"	lb.	.18½ -	.25
"Voltex"	lb.	.15 -	.18½

Furnace, High Elongation (HEF) (bags)

"Sterling K"	lb.	.05 -	.09

Furnace, High Modulus (HMF) (bags)

"Continex HMF"	lb.	.05 -	.09
"Dixie 40"	lb.	.05 -	.09
"Kosmos 40"	lb.	.05 -	.09
"Modulex"	lb.	.05 -	.09
"Philblack A"	lb.	.05 -	.06
"Statex 93"	lb.	.05 -	.09
"Sterling L"	lb.	.05 -	.09

Furnace, Semi-Reinforcing (SRF) (bags)

"Colloidal Black Dispersion 33" (drums)	lb.	.12¾ -	.13¾
"Continex SRF"	lb.	.03½ -	.07½
"Dixie 20"	lb.	.03½ -	.07½
"Essex"	lb.	.03½ -	.07½
"Furnex"	lb.	.03½ -	.07½
"Gastex"	lb.	.03½ -	.07½
"Kosmos 20"	lb.	.03½ -	.07½
"Pelletex"	lb.	.03½ -	.07½
"Seminex"	lb.	.03½ -	.05½
"Sterling R"	lb.	.03½ -	.07½
"Sterling S"	lb.	.03½ -	.07½

Furnace, Fine (FF) (bags)

"Statex B"	lb.	.05¾ -	.09¾

Thermal, Fine (FT) (bags)

"P-33" (c.l.)	lb.	—— -	.05

Thermal, Medium (MT) (bags)

"Thermax" (c.l.)	lb.	—— -	.03

REINFORCING AGENTS—MISCELLANEOUS

"Darex Copolymer No. 3"	lb.	.39½ -	.42
"No. X34"	lb.	.45 -	.47½
"Darex Copolymer Latex No. 3 (and "X34")	lb.	.44½ -	.50
"Durez 12687" (and "12707")	lb.	.27½ -	.29
"Marbon B"	lb.	.65 -	.75
"S" and "S-1"	lb.	.41 -	.48
"Marmix"	gal.	1.35 -	1.75
"Naftex EPC"	lb.	.08¼ -	.11¼
"HMF"	lb.	.06⅜ -	.09
"MPC"	lb.	.08¼ -	.11¼
"SRF"	lb.	.05⅝ -	.07⅞
"Wilcorite R Resins"	lb.	.29 -	.35

RETARDERS

"E-S-E-N"	lb.	.34 -	.36
"Retardac 15A"	lb.	.15 -	.16½
"Retardex"	lb.	—— -	.55

RUBBER SUBSTITUTES

Mineral Rubber

"38"	ton	26.00 -	32.50
"Black Diamond"	ton	26.00 -	27.50
"Byerlyte"	ton	36.00 -	50.00
Gilsonite, Selects (c.l.)	ton	33.50 -	34.50
"Hard Hydrocarbon" (dms.)	ton	32.00 -	34.00
"Herron Flake"	ton	40.00 -	42.00
Mineral Rubber, Granulated	ton	30.00 -	35.00
Solid	ton	27.00 -	32.00
"Parmr" (drums)	ton	26.00 -	30.00
"Pioneer"	ton	33.00 -	60.00

Vulcanized Vegetable Oils (Factice)

"Amberex"	lb.	.27 -	.38
Brown	lb.	.18 -	.38
Dispersed	lb.	.28 -	.49
"Neophax"	lb.	.20 -	.38
White	lb.	.13 -	.39

Miscellaneous Rubber Substitutes

"Gilsowax"	lb.	.04½ -	.05
"Insulac"	lb.	.06 -	.06½
"Resin No. 1098" (drums)	lb.	—— -	.42
"No. 1198"	lb.	.31 -	.35
"Wilmex M-4" (and "M-6")	lb.	.05½ -	.06

SOLVENTS

Acetone (dlvd.)	lb.	.07 -	.09
"American" Dipentene (t.c.)	gal.	.60 -	.67
"Amsco" Lactol Spirits (t.c.)	gal.	—— -	.13
"Rubber Solvent" (t.c.)	gal.	—— -	.12½
"Solv A" (t.c.)	gal.	—— -	.18
"Solv B" (t.c.)	gal.	—— -	.19½
"Special Napthalite" (t.c.)	gal.	—— -	.12½
"Textile Spirits" (t.c.)	gal.	—— -	.13
Amyl Chlorides, Mixed (l.c.l.) (drums)	lb.	—— -	.08
Benzol 90%	gal.	.17 -	.24
Butyl Acetate (t.c.)	lb.	—— -	.198
Butyl Alcohol (t.c.)	lb.	—— -	.206
Secondary (dlvd.)	lb.	.09½ -	.11½
Tertiary (dlvd.)	lb.	.11 -	.13
Carbon Bisulfide, Tech.	lb.	.05 -	.08
Carbon Tetrachloride	gal.	—— -	.80
Cyclohexane	lb.	.09½ -	.13
Cyclohexanone	lb.	.25 -	.27 a
Diacetone, Pure (dlvd.)	lb.	.11½ -	.13½
Dichlorethyl Ether (drums)	lb.	.16 -	.17
Formal (drums)	lb.	.26 -	.27
Dichloropentane (l.c.l.)	lb.	—— -	.04½
"Dipentene 122" (dms.)	gal.	.68 -	.70
Ethyl Alcohol (t.c.)	gal.	.53½ -	.55½
Ethylene Dichloride (drums, dlvd.)	lb.	.08 -	.09
"Halowax Oil"	lb.	.27 -	.30
Heptanes (t.c.)	gal.	—— -	.15
"Hexalin Cyclohexanol"	lb.	.20 -	.22 a
Hexanes (t.c.)	gal.	—— -	.15⅜
Isopropyl Alcohol, Ref. 99% (dlvd.)	gal.	.40½ -	.53
Ether, Ref. (dlvd.)	lb.	.04½ -	.06½
Mesityl Oxide (dlvd.)	lb.	.11½ -	.13½
Methanol (dms., dlvd.)	gal.	.37 -	.44
Methyl Acetone, Syn. (drums, dlvd.)	gal.	.46 -	.52
Methyl n-Amyl Ketone (drums)	lb.	.29 -	.30
Methyl Ethyl Ketone	lb.	.09 -	.11
Methyl Isobutyl Ketone (dlvd.)	lb.	.12½ -	.14½
"N-5" Pentane Mix. (t.c.)	gal.	—— -	.06½
"N-6" Hexanes (t.c.)	gal.	—— -	.11¼
"N-7" Heptanes (t.c.)	gal.	—— -	.10½
"Petrolene" (t.c.)	gal.	—— -	.10⅛
Picolines, Alpha, Refined	lb.	.245 -	.25
Mixed	lb.	.24 -	.25
Pyridine, Refined	lb.	.55 -	.55½
Quinoline	lb.	.32 -	.32½
"Rubber Solvent" (t.c.)	gal.	—— -	12.50
"Rubsol" (t.c.)	gal.	—— -	.08625
"Skellysolve B" (Hexanes) (t.c.)	gal.	—— -	.11¼
"C" (Heptanes) (t.c.)	gal.	—— -	.10½
"E" (Octanes) (t.c.)	gal.	—— -	.13
"R" (Solvent Naphtha)	gal.	—— -	.088
"Soivenol"	gal.	.54 -	.63
Solvent, Crude, Light	gal.	.19 -	.28
"Solvesso 100" (t.c.)	gal.	—— -	28.12
"150" (t.c.)	gal.	—— -	28.12
"Sunny South" Dipentene	gal.	.60 -	.67
Toluene (drums)	gal.	—— -	.28
Toluol (t.c.)	gal.	—— -	23.00
Trichlorethane	lb.	.11 -	.12
Triglycol Dichloride (drums)	lb.	—— -	.49
"Tromex"	lb.	.078 -	.083
"X-7" Sp. Heptanes (t.c.)	gal.	—— -	.10
"X-8-A Solvent Naphtha"	gal.	—— -	.07¾
Xylene (drums)	gal.	—— -	.28
Xylol (t.c.)	gal.	—— -	25.00

STABILIZING AGENTS (for Vinyl Resins)

"Dutch Boy DS-207"	lb.	—— -	.52¼
"Plumb-O-Sil A"	lb.	—— -	.26
"Tribase"	lb.	—— -	.22¼
Lead Stearate, Precip.	lb.	.55 -	.57
Fused	lb.	.60 -	.62
"Stabelan A"	lb.	.55 -	.65
"Stabilizer JCX"	lb.	—— -	.45
"SN"	lb.	.36 -	.42
"V-1-N"	lb.	.44 -	.50
"V-9"	lb.	—— -	.85
"Vanstay"	lb.	.38 -	.40

SUN CHECKING AGENTS

"Antisol"	lb.	.23	.24
"Heliozone" (dlvd.)	lb.	.23	.24
"Sunproof"	lb.	.23	.24
"Jr."	lb.	.17	.18
"Tonox"	lb.	.50	.52

TACKIFIERS

"Advaresin 100"	lb.	.14½	.15
"Agchem RC 30"	gal.	.65	1.34
"Amberol ST-137X"	lb.	.33	.33½
"Beckopol 1400"	lb.	.27	.28
"Dutrex 44"	gal.	——	.919
"E-310 Resin Emulsion"	lb.	——	.14
"Galex"	lb.	.13¼	.25
"Koresin"	lb.	.40	.52
"Lindol Emulsion" (drums)	lb.	——	.27
"Liquid Rubber Flux"	lb.	——	.125
"Nevilloid C-55" (drums)	lb.	——	.12
"Pentacizer 344"	lb.	——	.20
"Pentalyn Resins" (dlvd.)	lb.	.14¼	.21
"Resin V"	lb.	——	.25¾
"Rubtack"	lb.	——	.12
"Staybelite Esters" (dlvd.)	lb.	.15	.23¾
"Super-Beckacite No. 1001"	lb.	.37	.38
"Wilcorite R-30"	lb.	——	.40

THICKENERS (FOR LATEX)

"Acrysol GS"	lb.	.14½	.22
"Betanol" (drums)	lb.	——	.70
"Emulsorex No. 5"	lb.	——	.35
Propylene Laurate (drums)	lb.	——	.36
Sodium Silicate	lb.	.01	.02

VULCANIZING AGENTS

Selenium

"Vandex"	lb.	——	2.00

Sulfur

"Crystex" (l.c.l.)	lb.	.32	.35
"Dispersed Sulfur"	lb.	——	.09
"No. 2"	lb.	.08	.12
"Devil" (c.l.)	cwt.	——	1.35
"Insoluble Sulfur 60"	lb.	——	.16
"Star" (c.l.)	cwt.	——	1.85
"Tire"	cwt.	1.35	2.15
"Tube" (c.l., dlvd.)	cwt.	——	2.60

Tellurium

"Latex Telloy"	lb.	——	1.75
"Telloy"	lb.	——	2.00

Miscellaneous Vulcanizing Agents

"VA-3"	lb.	.55	.65
"Vultac No. 1"	lb.	.38	.45
"No. 2"	lb.	.38	.45
"No. 3"	lb.	.42	.49

WASHING & FINISHING AGENTS

"Apcolene" (t.c.)	gal.	——	.09⅜

WETTING AGENTS

"Advawet No. 15"	lb.	——	.18¼
"No. 33"	lb.	.40	.43
"Aerosol OT 70% Clear"	lb.	.80	1.00
"Agchem SA-15" ("16, 18")	lb.	.17	.29
"Alrosol" (dms.)	gal.	——	.48
"Aquarex BBX Conc." (dlvd.)	lb.	——	.78
"D" (dlvd.)	lb.	——	.75
"ME" (dlvd.)	lb.	——	.90
"NS" (dlvd.)	lb.	——	.90
"NS" (dlvd.)	lb.	——	.75
"Areskap 50"	lb.	.30	.38
"Dry 100"	lb.	.60	.72
"Aresket 240"	lb.	.30	.38
"Dry 300"	lb.	.60	.72
"Aresklene 375"	lb.	.42	.57
"Dry 400"	lb.	.70	.84
Lecithin	lb.	——	.26
"Santomerse D"	lb.	.43	.65
"S"	lb.	.13	.25
"Sorbit P"	lb.	——	.28
"Stablex G"	lb.	——	.70
"Triton K-60"	lb.	33½	.41
"N-100"	lb.	.59½	.67
"R-100"	lb.	.14½	.25
"720"	lb.	.30½	.38
"770"	lb.	.21¾	.29¼
"Vultamol"	lb.	——	.17½

MISCELLANEOUS CHEMICALS

"Acto 450" ("550-W," "600," "630")	lb.	.109	.145
"Agchem SA-17"	lb.	——	.29
"Aquarex SMO" (dlvd.)	lb.	——	.50
"A.S.T.M. Oil No. 1" (and "No. 3")	gal.	1.00	1.15
"Black Shield 4701"	lb.	——	.21
"Copper Inhibitor X-872-L"	lb.	——	1.50
2-Ethylhexanol (dms., dlvd.)	lb.	.25	.26
Glycerine, 88% Sap., Crude (dlvd.)	lb.	.23½	.24
"Hydrozo"	lb.	——	.51
"MODX" (tons)	lb.	——	.29½
"Para Resin No. 1784"	lb.	——	.09¾
"No. 2457" (c.l.)	lb.	——	.04
"No. 2718" (c.l.)	lb.	——	.04
"pHR"	lb.	——	1.25
"Resin No. 1226"	lb.	.31½	.36½
Resorcinol (dlvd.)	lb.	——	.64
"Rio Resin"	lb.	.43	.45
"Santocel"	lb.	——	.50
"Sublac"	lb.	.31	.34
"Synpep N" (drums)	lb.	——	.54
"Thiokol LP-2"	lb.	——	.85
"LP-3"	lb.	——	.95
"Tysonite"	lb.	.21½	.22¼
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Pulverized	lb.	——	.06

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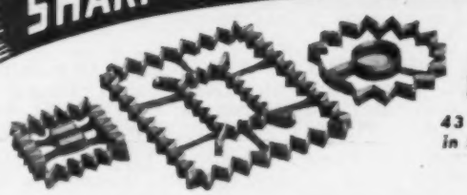

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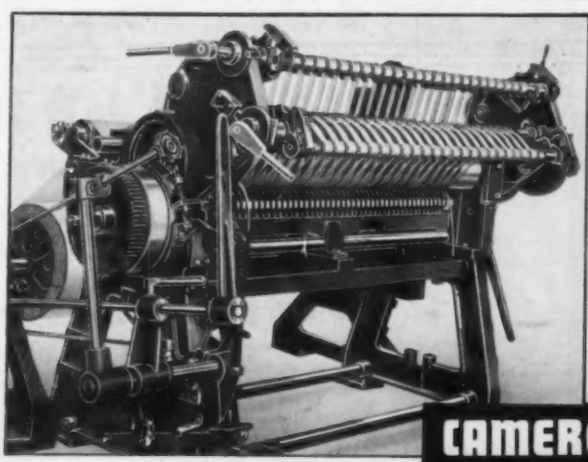

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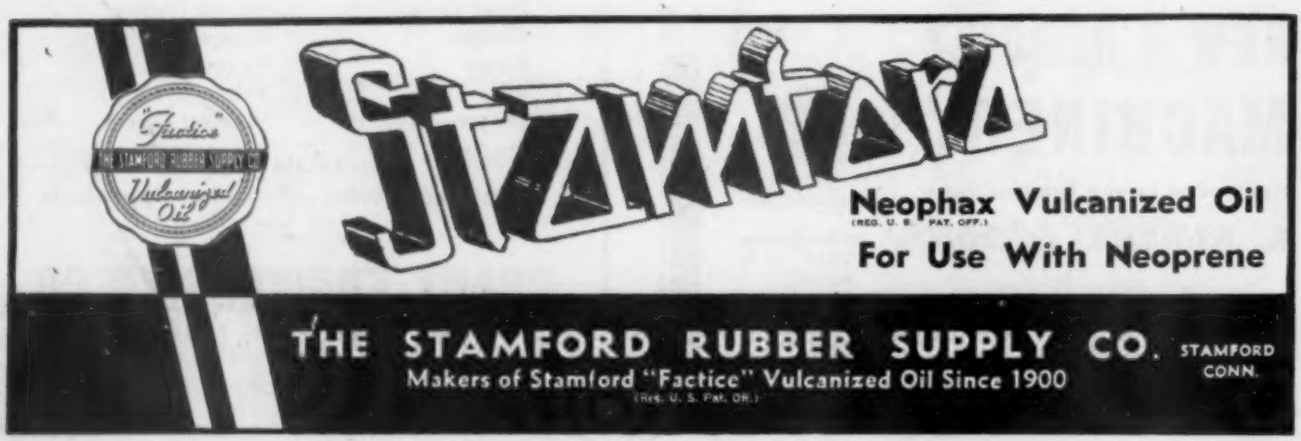

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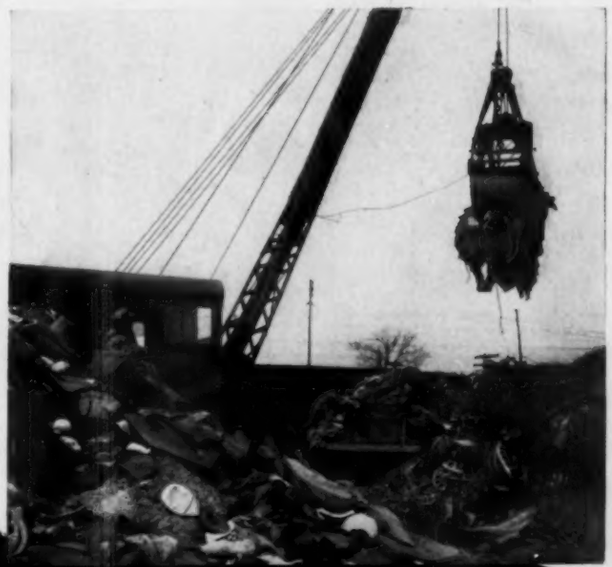
From the moment of arrival on Schulman platforms, Scrap Rubber is handled smoothly, efficiently. Here, electric trucks whisk tires to Processing, miscellaneous mechanical scrap and inner tubes to sorters for grading.

←

Schulman yard cranes lift, shift enormous tonnages of Mixed Scrap, save customer money. From here, Scrap hits sorting conveyor.

→



EFFICIENT HANDLING

Trained sorters pick out types, grades, colors . . . drop them into correct bins. Every piece must fit a Schulman classification.

Tough, speedy handling trucks move bales and skids of prepared Scrap from storage into railroad cars and trucks. Schulman methods are reflected in lower costs to you.

A. Schulman Inc.
Rubber and Plastics

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